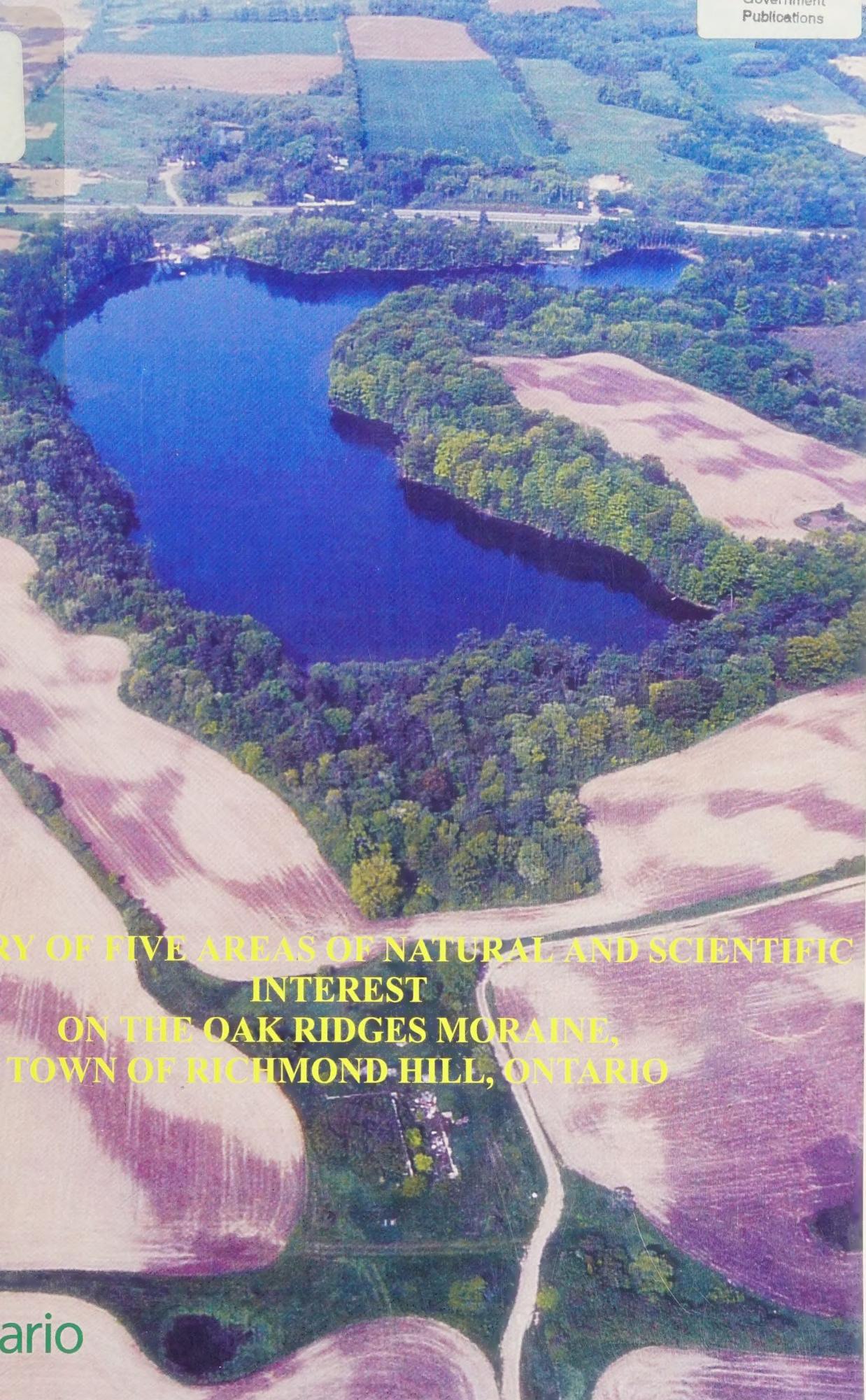


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**INVENTORY OF FIVE AREAS OF NATURAL AND SCIENTIFIC
INTEREST
ON THE OAK RIDGES MORAINE,
TOWN OF RICHMOND HILL, ONTARIO**



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May 2001

*Ontario Ministry of Natural Resources
Aurora District*



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The cover is an aerial photograph of the Bond Lake & Bog ANSI in the foreground looking west to the Philips Lake ANSI in the left background.

Photographed by Paul Savoie

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The Location for Five ANSIs in Richmond Hill

Legend

- Area of Natural and Scientific Interest (ANSI)
- Woodland
- Regenerating Land
- Wetland
- Kettle Lake
- Intermittent Stream
- Cold Water Stream
- Contour Line
(5 metre interval)
- Road
- Railway

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Printed in Ontario, Canada



Scale 1:30,000 (Approx.)
300 0 300 600 M



King Rd.

Bond Lake &
Bog ANSI

Philips Lake
ANSI

Jefferson Sideroad

Jefferson
Forest ANSI

Bloomington Rd.

Lake St.
George ANSI

Bethesda Rd.

Lake Wilcox
Wetlands &
Uplands ANSI

Stouffville Rd.

Leslie St.

19th Ave.

Yonge St.

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*Ontario Ministry of Natural Resources
Aurora District
May 2001*

Introduction

The Richmond Hill portion of the Oak Ridges Moraine is noteworthy for its five life science Areas of Natural and Scientific Interest (ANSIs). This concentration of ANSIs is reflective of the high diversity of landforms, soils, slopes and vegetation in this part of the Moraine. Summaries of each of the five ANSIs have been prepared, followed by lists of vascular plants, breeding birds, reptiles, amphibians, mammals and fishes in the appendices.

Landforms

Five major east-west trending landforms characterize the Richmond Hill portion of the Moraine. In the north, the main ridge of the Moraine occurs along Bloomington Road. To the south, a second ridge known as the Maple Spur is situated along Jefferson Sideroad and Stouffville Road. The two ridges consist of sands, silts and gravels. The southern ridge is dissected by a series of dry north-south trending valleys. Along the north side of the southern ridge there is a third landform, an area of hummocky topography, where isolated depressions or kettles are common including Philips Lake, Bond Lake and Swan Lake as well as a number of smaller kettle wetlands. This hummocky topography consists of sands covered in a veneer of silt tills, with organic deposits prevalent in many of the kettle wetlands. Between the two ridges and the area of hummocky topography there is a fourth landform, a sand floored broad valley. This valley supports numerous kettle wetlands, headwater wetlands for the East Humber River, as well as Lake Wilcox, the largest kettle lake on the Moraine, and Lake St. George. South of the southern ridge, there is a fifth landform, the gradually sloping South Slope. Near the base of the Moraine, the South Slope supports numerous headwater swamps on organics that are fed by groundwater discharge. Coldwater streams of the Rouge and Don River watersheds begin in these swamps.

Vegetation

The Richmond Hill portion of the Moraine sustains a high diversity of vegetation communities: kettle wetlands, headwater wetlands, kettle lakes, kettle bogs, a graminoid fen, moist deciduous/mixed forests, dry deciduous/mixed forests, successional forests, thickets and fields. The area sustains 7 of the 32 kettle lakes found on the Moraine and 7 of its 33 kettle bogs (OMNR 2001). The moist forests of Eastern Hemlock and Sugar Maple and the drier forests of Red Oak, White Pine and Red Maple are some of the best examples on the Moraine. Many of the forests are concentrated in the Jefferson Forest tract, one of the 14 largest forest blocks on the Moraine (OMNR 2001).

Representation

Kettle wetlands are best represented at Lake Wilcox Kettle Wetlands & Uplands ANSI. Kettle bogs are found at the Lake Wilcox Kettle Wetlands & Uplands, Bond Lake & Bog and Philips Lake ANSIs. Philips Lake, Lake St. George and the Bond Lake & Bog ANSIs are three of the best examples of kettle lakes on the Moraine. All three are noted for their water quality and clarity and their associated wetlands and open water aquatic communities. Groundwater-fed headwater wetlands, a graminoid fen and coldwater streams are found in the Jefferson Forest ANSI.

The forests are best represented at Jefferson Forest and Lake Wilcox Kettle Wetlands & Uplands ANSIs. There is also good representation of older forests at Bond Lake & Bog ANSI.

Diversity & Special Features

The Richmond Hill portion of the Moraine supports a large diversity of plants and animals. A total of 639 plant species occur in the five ANSIs, with 491 of these species native (Appendix A). This represents 95% of the native species known to occur in the Richmond Hill portion of the Moraine. Of the native species in the ANSIs, 140 of them are considered significant species, with 4 provincially rare, 8 regionally rare (Riley 1989a) and 128 locally rare (Varga et al. 2001).

There are 81 breeding bird species in the five ANSIs (Appendix B). Of these, 43 are significant species that are identified as species of concern by the Toronto and Region Conservation Authority (TRCA 1999), sensitive forest birds (Cadman 1999, Couturier 1999, Burke & Nol 2000) or conservation priority species by Bird Studies Canada (Couturier 1999).

There are 18 reptile and amphibian species including the nationally threatened Jefferson Salamander and 8 species of concern in the TRCA watershed (Appendix C). These species of concern are indicative of good quality wetlands and they have a high sensitivity to urbanization since they are rare or absent in the urbanized portion of the TRCA watershed. There are also 22 mammal species (Appendix D), including one species of concern in the TRCA watershed and 26 fish species (Appendix E), including the provincially threatened Redside Dace found in the coldwater streams of Jefferson Forest ANSI. The definitions for the various significant designations assigned to plants and animals are outlined in the ANSI summaries and in the appendices.

Condition

Four of the ANSIs are generally undisturbed in a southern Ontario context, with Philips, Bond and St. George Lakes noted for their water quality and their forested kettle slopes and Wilcox Kettle Wetlands & Uplands for its forests and kettle wetlands. Bond Lake in particular has mature forested slopes. Significant disturbances have occurred to portions of Jefferson Forest ANSI, including golf course fairways and estate residential development. Noteworthy forests and headwater swamps in Jefferson, however, still remain largely undisturbed. Exotic plant species have taken over some of the upland habitats around Lake St. George.

Ecological Function

The five Richmond Hill ANSIs are in close proximity to each other, forming part of a major east-west grouping of natural heritage and water resources features on the Oak Ridges Moraine in Richmond Hill.

The five ANSIs occur in the midst of an agricultural landscape. This landscape provides low resistance to the movement of animals and is used for foraging and nesting by ANSI wildlife. For example, woodland frogs and woodland salamanders travel seasonally between the Jefferson Forest ANSI and, to the north, the Bond Lake & Bog and Wilcox Lake Kettle Wetlands & Uplands ANSIs. Woodland frogs also move in and around Lake St. George and Philips Lake ANSIs to neighbouring wetlands and woodlands. Leopard Frogs travel between the ANSIs' kettle lakes, which they use for winter hibernating sites, to seasonally flooded wetlands for breeding, and then to the surrounding agricultural landscape for foraging. American Toads breed in many of the wetlands and lakes in the ANSIs, hibernate in its forests and then forage in the surrounding rural mosaic of forests and fields. The resident turtles of Philips Lake, Lake St. George, Lake Wilcox Kettle Wetlands & Uplands and Bond Lake & Bog rely on surrounding fields and agricultural lands for nesting. White-tailed Deer in the five ANSIs are dependent on winter concentration areas at the large headwater swamps of Jefferson Forest ANSI and the hemlock forests and swamps of Lake Wilcox Kettle Wetlands & Uplands ANSI. Wetlands in the latter ANSI, in the bog at Bond Lake & Bog ANSI and in surrounding wetlands are critical nursery areas for female deer and their fawns.

The ANSIs are linked to surrounding woodlands and wetlands. For example, the 47 wetlands in the ANSIs are part of larger groupings of 170 wetlands contained in three provincially significant wetland complexes: Philips - Bond - Thompson Lakes, Wilcox - St. George and Rouge River Headwater Wetland Complex. Woodland frog and woodland salamander populations in the ANSIs utilize a number of the wetlands that surround the ANSIs as breeding sites.

The Bond Lake & Bog, Lake St. George, Lake Wilcox Kettle Wetlands & Uplands and Jefferson Forest ANSIs are part of a wooded tract that is recognized as one of the 14 largest woodland groupings on the Oak Ridges Moraine (OMNR 2001). The woodlands in these four ANSIs provide habitat for 21 of Ontario's most sensitive forest bird species, as well as 7 raptor species including Barred Owl, Broad-winged Hawk, Northern Goshawk, Red-tailed Hawk, Red-shouldered Hawk, Sharp-shinned Hawk and Eastern Screech Owl.

The ANSIs contain significant and sensitive water resource features such as recharge and discharge areas. Internally drained areas like those at Bond Lake & Bog, Philips Lake, Lake Wilcox Kettle Wetlands & Uplands ANSIs and the permeable soils of all five ANSIs are part of a major recharge area for aquifers on the Moraine. Groundwater discharge zones along the base of the Moraine such as in the Jefferson Forest ANSI, are part of a significant headwater source for the Rouge River watershed. Around Lake St. George ANSI there are headwater sources for another major watershed, the Humber River.

Conclusion

Based on the inventory work and a comparative analysis of ANSIs on the Moraine, four of the ANSIs are given provincial status, including Lake Wilcox Kettle Wetlands & Uplands, Bond Lake & Bog, Philips Lake and Lake St. George. The Jefferson Forest ANSI is given regional status.

The five ANSIs and the surrounding woodlands, wetlands, stream corridors, regenerating lands and agricultural lands and the significant water resource features should be protected as part of a natural heritage system. The Richmond Hill portion of the Oak Ridges Moraine is one of the most significant areas on the Moraine noted for its concentration of kettle lakes, kettle bogs, kettle wetlands, headwater wetlands, coldwater streams woodlands and significant recharge and discharge areas.

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INVENTORY OF THE JEFFERSON FOREST AREA OF NATURAL AND SCIENTIFIC INTEREST

***Ontario Ministry of Natural Resources
Aurora District
May 2001***

OBM Map: 10 17 6250 48600, 6250 48650, 6200 48600, 6200 48650

NTS Map: 30M/14; **UTM Reference:** 625500 4864500

Latitude: 43° 55' 30" **Longitude:** 79° 26'

Area: 349 ha

Aerial Photographs: 1:10,000, MNR, 1978, Roll 48, Line & No. 4366: 287-289; Roll 49, Line & No. 4365: 414-417; Roll 53, Line & No. 4364: 94-99; 1:24,000, 10 May 1992, Roll 033, Line & No. 12-28-30; 1:10,000, MNR, 1997, infrared, Roll & No.: 37: 6283-6287; Roll & No.: 38: 6491-64955.

Municipality, Lots & Concessions: Regional Municipality of York, Town of Richmond Hill, Whitchurch Geographic Township: Lots 1-3, Conc.2; Lots 1-3, Conc. 1; Markham Geographic Township: Lots 56-60, Conc.1 EYS; Lots 31-35, Conc. 2.

General Location: northern portion of Richmond Hill, north and south of Stouffville Road, south to 19th Avenue and bound to the west by Yonge Street and to the east by Leslie Street.

Site District: 6E7

Ownership: 99% Private; 1% Toronto and Region Conservation Authority (TRCA)

Date of Investigations: 1983; 1996: May 3, 15, 22, 28; June 12, 19; July 4; August 19, 23, 26, 28; Sept. 4-6; October 6, 12, 13, 28, 29; 2000: Sept.; 2001: April 26.

Investigators: MNR: Steve Varga, Kari Van Allen and Adriana Stagni; TRCA: Lionel Normand

Compiler: Steve Varga

Introduction

The Jefferson Forest ANSI occurs on the Oak Ridges Moraine in the northern portion of the Town of Richmond Hill. The Moraine is noteworthy for its extensive forests and diverse wetlands that range from headwater swamps to kettle bogs and kettle lakes (OMNR 2001). Its scenic hills stretch east for 160 km from the Niagara Escarpment through the heart of the Greater Toronto Area to terminate beyond Rice Lake.

This inventory is part of ongoing work to re-examine and update Areas of Natural and Scientific Interest (ANSIs) on the Oak Ridges Moraine (site district 6E7) (Lindsay 1984, OMNR 2001).

The fieldwork for Jefferson Forest ANSI was done in partnership with the Toronto and Region Conservation Authority (TRCA). The inventory also incorporates the biological work of James Kamstra for the northwestern and southwestern portions of the ANSI (Gartner Lee Ltd. 1997, 1999, 2000).

Jefferson Forest was first identified in 1974 as two confluent International Biological Programme (IBP) Sites under the auspices of UNESCO's Committee for Terrestrial Ecosystems (Macdonald 1974). In 1984, the site was identified as two confluent regional Areas of Natural and Scientific Interest (ANSIs) known as Jefferson Forest West Section and East Section. These two ANSIs were selected for their representation of morainal upland forests in Site District 6E7, an area covering the Oak Ridges Moraine (Lindsay 1984).

The ANSI has also been identified as an Environmentally Significant Area (ESA) by TRCA (MTRCA 1982, TRCA 1996a). York Region has identified the site as an Environmental Policy Area, a Wetland, a Significant Forest and part of the Regional Greenlands System in its 1994 Official Plan. The wetlands in the southeast portion of the ANSI are part of the provincially significant Rouge River Headwater Wetland Complex (OMNR 2000).

Physiography

The Oak Ridges Moraine is one of the province's largest moraines, rising up to 300 metres above the surrounding lake plains. The Moraine was created under and between the margins of two glacial ice sheets. Meltwaters deposited huge amounts of sands, silts and gravels in a large lake now occupied by the Moraine (Barnett et al 1998)

At the Jefferson Forest ANSI, the moraine consists of vigorously rolling sand and gravel uplands that are dissected by two major valleys. Extensive seepage emanating along the base of the southern portion of these valleys serves as headwaters for two coldwater tributaries of the Rouge River.

The ANSI's highly permeable morainal deposits are part of a major recharge area for the Moraine's aquifers (Hunter and Assoc. with Raven Beck Environ. Ltd 1996).

Vegetation

The Jefferson Forest ANSI contains a high diversity of 89 vegetation community types (Table 1).

Most of the ANSI consists of upland forests. The ridgelines and knolls sustain drier forests dominated by Red Oak with White Pine, Red Maple and Sugar Maple as common associates. In the younger forests, Red Oak co-dominates or is a secondary species with White Birch, Large-toothed Aspen and Trembling Aspen. These oak forests have a common shrub layer of Witch-hazel (*Hamamelis virginiana*), Round-leaved Dogwood (*Cornus rugosa*), Beaked Hazel (*Corylus cornuta*), Maple-leaved Viburnum (*Viburnum acerifolium*) and Bush-honeysuckle (*Diervilla lonicera*). Below the shrubs there are herbs and sedges of Large-leaved Aster (*Aster macrophyllus*), Pennsylvania Sedge (*Carex pensylvanica*), Bracken Fern (*Pteridium aquilinum*), Pointed-leaved Tick-trefoil (*Desmodium glutinosum*), Poison Ivy (*Rhus radicans*) and Wild Sarsaparilla (*Aralia nudicaulis*).

Small openings in the oak forests are dominated by Poverty Oat Grass (*Danthonia spicata*) and Canada Blue Grass (*Poa compressa*) with scattered Pennsylvania Sedge, Bracken Fern, Showy Tick-trefoil (*Desmodium canadense*), Sheep Sorrel (*Rumex acetosella*) and Wild Bergamot (*Monarda fistulosa*). These openings sustain a high concentration of significant plant species including Slender Cyperus (*Cyperus lupulinus*), Red-seeded Sedge (*Carex tonsa*), Columbia Panic Grass (*Panicum columbianum*) and Linear-leaved Panic Grass (*Panicum linearifolium*).

Forests of Red Maple are common. They are associated with Red Oak and White Pine on drier sites and Sugar Maple and Beech on moister sites. Frequent in the understorey are Evergreen Wood Fern (*Dryopteris intermedia*), Early Meadow-rue (*Thalictrum dioicum*), Christmas Fern (*Polystichum acrostichoides*) and Blue-stem Goldenrod (*Solidago caesia*).

Cooler northfacing slopes and large depressions, particularly in the southwest portion of the ANSI, support mature mixed and conifer forests dominated by Eastern Hemlock with such secondary species as White Pine, Red Maple, Red Oak, Sugar Maple and Beech. On some steep slopes, White Cedar is associated with or replaces Eastern Hemlock. Red Maple and Beech tend to be more prevalent broadleaf associates on fresh hemlock sites, while Sugar Maple is a common associate on moist hemlock sites. Common in the understorey of these mixed hemlock forests are such ferns as Lady Fern (*Athyrium filix-femina*), Evergreen Wood Fern and Spinulose Wood Fern (*Dryopteris carthusiana*), Marginal Wood Fern (*Dryopteris marginalis*). There are also herbs of Rose-twisted Stalk (*Streptopus roseus*), Wild Sarsaparilla, Blue-bead Lily (*Clintonia borealis*), Wild Lily-of-the-Valley (*Maianthemum canadense*), Peduncled Sedge (*Carex pedunculata*) and Partridgeberry (*Mitchella repens*) and occasionally low shrubs of Ground Yew (*Taxus canadensis*).

White Pine also dominates or is a strong secondary tree species in many mixed forests, particularly in the southwest portion of the ANSI. White Pine is associated with Eastern Hemlock and/or Red Maple, Red Oak and Beech. These mixed pine forests tend to be most prevalent on drier sites. When associated with broadleaf trees, the pine forests have a common shrub layer of Witch-hazel, Maple-leaved Viburnum, Chokecherry and Beaked Hazel and a herbaceous layer of Bracken Fern, Pennsylvania Sedge, Poison Ivy and Large-leaved Aster. When the pine forests are associated with Eastern Hemlock the understorey is sparse with scattered Wild Sarsaparilla, Evergreen Wood Fern, Partridgeberry and Fringed Polygala (*Polygala paucifolia*).

Sugar Maple forests are scattered through the ANSI, with the richest example confined in the southeast portion to a small stand on loamy soils. In this moist stand there is a rich spring wildflower display of White Trillium (*Trillium grandiflorum*), Yellow Trout-lily (*Erythronium americanum*), Zig-zag Goldenrod (*Solidago flexicaulis*) and Blue Cohosh (*Caulophyllum giganteum*), with a scattering of Virginia Waterleaf (*Hydrophyllum virginianum*), Christmas Fern, Wild Ginger (*Asarum canadense*) and Yellow Violet (*Viola pubescens*). On sandier sites, fresh Sugar Maple forests have Red Maple and Beech as strong secondary tree species and an understorey of Wild Sarsaparilla, Evergreen Wood Fern and Blue-stem Goldenrod.

Succesional upland deciduous forests occur commonly in scattered stands throughout the ANSI. White Birch, Large-toothed Aspen and Trembling Aspen and White Birch dominate these forests, with Red Maple and Red Oak as strong secondary species.

Also frequent are mixed successional forests where White Birch, Trembling Aspen and Large-toothed Aspen are associated with White Pine. On some steep slopes or bordering swamps, White Cedar can also be a common associate.

There are occasional thickets of Staghorn Sumac (*Rhus typhina*) and regenerating fields of Canada Blue Grass and Tall Goldenrod (*Solidago altissima*). The largest occur in the central-western portion of the ANSI.

Conifer plantations are scattered throughout the ANSI, with most planted in Red Pine and the occasional Scots Pine, White Spruce, Jack Pine and White Pine. These plantations support large populations of the uncommon One-sided Pyrola (*Orthilia secunda*) and Pipsissewa (*Chimaphila umbellata*) among the more common Bracken Fern, Peduncled Sedge, Poison Ivy and Wild Lily-of-the-Valley. A few small mixed and deciduous plantations are found in the southwest corner of the ANSI.

Large seepage-fed wetlands occur in two valleys in the southern portion of the ANSI and at the base of the moraine in the southeast corner of the ANSI.

The wetlands at the base of the moraine are dominated by conifer and mixed swamps of White Cedar and White Cedar - Tamarack, ranging from mature stands to younger stands mixed with Trembling Aspen and White Birch. Common in the understorey are Dwarf Raspberry (*Rubus pubescens*), Wild Sarsaparilla, Foamflower (*Tiarella cordifolia*), Sensitive Fern (*Onoclea sensibilis*), Bulblet Fern (*Cystopteris bulbifera*) and Naked Mitrewort (*Mitella nuda*). The occasional deciduous swamps are dominated by Balsam Poplar, Trembling Aspen, White Birch and Green Ash. Dwarf Raspberry, Field Horsetail (*Equisetum arvense*) and Sensitive Fern dominate the understoreys of these swamps.

Scattered through the swamps are several seepage fed marshes variously dominated by Purple-stemmed Aster (*Aster puniceus*), Spotted Jewelweed (*Impatiens capensis*), Spotted Joe-Pye-Weed (*Eupatorium maculatum*), Reed Canary Grass and Water Horsetail (*Equisetum fluviatile*). Other small openings support thicket swamps of Pussy Willow (*Salix discolor*), Red-osier Dogwood (*Cornus stolonifera*) and Missouri Willow (*Salix eriocephala*) with understoreys of Field Horsetail, Sensitive Fern and Spotted Jewelweed. There is also a graminoid fen dominated by Water Horsetail with scattered Bog Goldenrod (*Solidago uliginosa*), Porcupine Sedge (*Carex hystericina*), Sensitive Fern, Red-sheathed Bulrush (*Scirpus microcarpus*), Spotted Jewelweed and Three-leaved Solomon's-seal (*Maianthemum trifolium*).

The seepage wetlands in the valleys are dominated by mature White Cedar and Eastern Hemlock swamps and the occasional younger swamps of White Cedar mixed with Trembling Aspen and White Birch. The understoreys have scattered shrubs of Mountain Maple (*Acer spicatum*) and a rich herb layer of Spotted Jewelweed, Ostrich Fern (*Matteuccia struthiopteris*), Lady Fern, Sensitive Fern, Bulblet Fern, Evergreen Wood Fern, Field Horsetail, Rough Sedge (*Carex scabrata*) and Dwarf Raspberry. Scattered openings in these swamps sustain meadow marshes of Spotted Jewelweed and thicket swamps of Mountain Maple.

Two small seepage marshes on thick peats in the southeastern portion of the ANSI north of the railway support a cattail marsh and a marsh of Sensitive Fern, Purple-stemmed Aster and Panicked Aster (*Aster lanceolatus*).

Three small dugout ponds in these wetlands support open water aquatic communities of Common Duckweed (*Lemna minor*), a blue-green algae known as Starwort (*Chara* sp.) and Sago Pondweed (*Potamogeton pectinatus*). The largest pond, along a stream in the east-central portion of the ANSI also has a Common Cattail (*Typha latifolia*) and Reed Canary Grass marsh.

Table 1. Vegetation community types

Dominant species are noted in bold

Wetland Community Types

1. Open Water Aquatics
 - a. Sago Pondweed – Starwort (*Chara* sp.)
 - b. Starwort (*Chara* sp.)
 - c. Common Duckweed
2. Organic Marsh
 - a. Water Horsetail - Spotted Jewelweed
 - b. Purple stemmed Aster - Spotted Jewelweed - Spotted Joe-Pye-Weed
 - c. Spotted Joe-Pye-Weed - Reed Canary Grass
 - d. Spotted Jewelweed
 - e. Sensitive Fern – Purple-stemmed Aster – Paniced Aster
 - f. Common Cattail
3. Mineral Marsh:
 - a. Common Cattail
 - b. Reed Canary Grass
4. Organic Thicket Swamp
 - a. Pussy Willow
 - b. Red-osier Dogwood - Missouri Willow
 - c. Mountain Maple
5. Mineral Thicket Swamp:
 - a. Red-osier Dogwod
6. Open Fen:

Water Horsetail - Sensitive Fern - Bog Goldenrod - Spotted Jewelweed - Red-sheathed Bulrush - Porcupine Sedge - Three-leaved Solomon's-seal

7. Deciduous Organic Swamp

- a. Successional Trembling Aspen
- b. Successional Trembling Aspen - White Birch
- c. Successional Green Ash
- d. Successional Balsam Poplar

8. Mixed Organic Swamp

- a. White Cedar - Tamarack - White Birch
- b. **Tamarack** - White Cedar - White Birch - Trembling Aspen
- c. White Cedar - Eastern Hemlock - Yellow Birch
- d. Successional White Cedar - Trembling Aspen
- e. Successional Trembling Aspen - White Birch - White Cedar

9. Conifer Organic Swamp

- a. White Cedar
- b. White Cedar - Tamarack
- c. White Cedar - Eastern Hemlock
- d. Eastern Hemlock

Terrestrial Community Types

10. Moist-Fresh Deciduous Forest

- a. Sugar Maple
- b. Red Maple

11. Dry-Fresh Deciduous Forest

- a. Red Oak
- b. Red Oak - Sugar Maple - Beech
- c. Red Oak - Sugar Maple
- d. Red Oak - Red Maple
- e. Red Maple
- f. Red Maple - Sugar Maple - Beech
- g. Sugar Maple
- h. Beech

12. Successional Deciduous Forest

- a. Sugar Maple - Black Cherry
- b. **White Birch** - Trembling Aspen - Red Maple - Red Oak
- c. White Birch - Red Oak
- d. White Birch - Large-toothed Aspen - Black Cherry
- e. **White Birch** - Large-toothed Aspen - Red Maple - Red Oak
- f. White Birch - Large-toothed Aspen - Red Maple - Red Oak
- g. White Birch
- h. **Large-toothed Aspen** - Trembling Aspen - Red Maple - Red Oak
- i. **Red Oak** - White Birch - Large-toothed Aspen
- j. Sugar Maple - Trembling Aspen
- k. Large-toothed Aspen - Red Oak
- l. Trembling Aspen
- m. Large-toothed Aspen
- n. Balsam Poplar

13. Moist-Fresh Mixed Forest

- a. Eastern Hemlock - Sugar Maple
- b. Eastern Hemlock - Red Maple - Sugar Maple
- c. Eastern Hemlock - Red Maple - Beech
- d. **Eastern Hemlock** - Sugar Maple - Yellow Birch
- e. Red Maple - White Pine

14. Dry-Fresh Mixed Forest:

- a. Red Oak - White Pine
- b. Red Maple - White Pine
- c. White Pine - Red Oak - Red Maple - Large-toothed Aspen
- d. **White Pine** - Red Maple - Red Oak - White Birch -

- e. Large-toothed Aspen
- f. **White Pine** - Red Maple - Beech - Red Oak
- g. **White Pine** - Eastern Hemlock - Sugar Maple
- h. **Eastern Hemlock** - White Pine - Beech
- i. Red Maple - Eastern Hemlock
- j. Eastern Hemlock - Red Oak - White Birch
- k. Red Oak - Eastern Hemlock - Red Maple
- l. **Beech** - Eastern Hemlock - Red Maple
- m. White Cedar - Red Oak - Large-toothed Aspen - White Birch

15. Dry-Fresh Mixed Forest

- a. White Pine - Red Maple
- b. White Pine - Red Oak

16. Successional Mixed Forest

- a. **White Cedar** - White Birch
- b. **Large-toothed Aspen** - White Cedar
- c. Large-toothed Aspen - White Pine
- d. White Birch - White Pine
- e. **Trembling Aspen** - White Pine
- f. **White Pine** - Trembling Aspen

17. Moist-Fresh Conifer Forest

- a. Eastern Hemlock
- b. Eastern Hemlock - White Cedar

18. Dry-Fresh Conifer Forest

- a. White Cedar
- b. White Pine

Cultural Community Types

19. Conifer Plantation

- a. Red Pine
- b. Red Pine - Scots Pine
- c. Red Pine - White Spruce
- d. Red Pine - White Pine
- e. White Spruce
- f. White Pine
- g. Jack Pine
- h. Scots Pine

20. Mixed Plantation:

- Black Walnut - Silver Maple - White Cedar - Scots Pine

22. Deciduous Plantation:

- Silver Maple

23. Thicket:

- Staghorn Sumac

24. Regenerating Field

- a. Poverty Oat Grass
- b. Canada Blue Grass
- c. Tall Goldenrod

Flora

Jefferson Forest supports 440 vascular plant species, with a high concentration of 49 significant flora (Table 2). Two species, Sharp-leaved Goldenrod (*Solidago arguta*) and Burning Bush (*Euonymus atropurpurea*), are provincially rare, one species, Fringed Gentian is regionally rare (Riley 1989) and 46 species are rare in the Ontario Ministry of Natural Resources site district 6E7 (Table 2). This district covers the entire Oak Ridges Moraine, the abutting South Slope and a portion of the Niagara Escarpment.

The provincially rare Burning Bush and Sharp-leaved

Goldenrod are southern species. Once more common in the Greater Toronto Area, the Burning Bush record at Jefferson Forest is now the only extant record in the GTA and the only one for site district 6E7. The record consists of only one shrub on a southfacing Red Oak slope forest. Sharp-leaved Goldenrod occurs in similar habitat and consists of several hundred plants scattered through the ANSI. On the Moraine it is also known from the confluent Lake Wilcox Kettle Wetlands & Uplands ANSI and from the Maple Uplands & Kettle Wetlands ANSI four kilometres to the west and several locations in Northumberland County. Fringed Gentian (*Gentiana crinita*) is found in a moist field along the railway and fringing a nearby cattail marsh.

The other 46 locally rare species largely occur in the ANSI's drier forests and its wetland swamps. Thirty-four species are restricted to drier deciduous and mixed forests and associated small openings. These include Wood Anemone (*Anemone quinquefolia*), Round-lobed Hepatica (*A. americanum*), Witch-hazel, Variable Hawthorn (*Crataegus macrosperma*), Pringle's Hawthorn (*C. pringlei*), Spotted Crane's-bill (*Geranium maculatum*), New York Fern (*Thelypteris noveboracensis*), Upland Bent Grass (*Agrostis perennans*), Spotted Coral-root (*Corallorrhiza maculata*), Naked-flowered Tick-trefoil (*Desmodium nudiflorum*), Broad-leaved Panic Grass (*Panicum latifolium*), Yellow Panic Grass (*P. xanthophysum*), Canada Wood-betony (*Pedicularis canadensis*), Hairy Goldenrod (*Solidago hispida*), Stout Goldenrod (*S. squarrosa*), Sweet Ox-eye (*Heliopsis helianthoides*), Poke Milkweed (*Asclepias exaltata*), Oval-headed Sedge (*Carex cephalophora*), Running Clubmoss (*Lycopodium clavatum*), Hickey's Ground-pine (*L. hickeyi*) and Languid Poa (*Poa languida*). Most plentiful in dry openings are Northern Dewberry (*Rubus flagellaris*), Big Bluestem (*Andropogon gerardii*), Columbia Panic Grass, Linear-leaved Panic Grass, Upland Willow, Red-seeded Sedge, Slender Wheat Grass (*Elymus trachycaulus*), Slender Cyperus, Canada Soapberry (*Shepherdia canadensis*), Lowbush Blueberry (*Vaccinium angustifolium*) and Velvet-leaf Blueberry (*V. myrtilloides*). The historical records for Smooth Aster (*Aster laevis*) and Slender Mountain-rice (*Oryzopsis pungens*) probably also occurred in these openings.

Twelve species including Northern Beech Fern (*Phegopteris connectilis*), Bog Goldenrod, Interrupted Fern (*Osmunda claytoniana*), Nodding Ladies' Tresses (*Spiranthes cernua*), Round-leaved Sundew (*Drosera*

rotundifolia), Showy Lady's Slipper (*Cypripedium reginae*), Foxtail Sedge (*Carex alopecoidea*), Spring Clearweed (*Pilea fontana*), Adder's Mouth (*Malaxis monophylla*), Creeping Snowberry (*Gaultheria hispida*), Loesel's Twayblade (*Liparis loeselii*); and Wood-sorrel (*Oxalis montana*) occur in wetlands largely consisting of seepage swamps.

Table 2. Significant vascular plants

Status: P - Provincially rare (Oldham 1999); R - Regionally rare (former OMNR Central Region, based on Riley (1989)); L - Locally rare in OMNR site district 6E7 (based on Varga et al 2001); * - Species also rare in the Regional Municipality of York. Source & date: SV - Steve Varga (1983, 1996), LG - L.A. Garay (1948), JC - J. Cruickshank, JK - James Kamstra (Gartner Lee Ltd. 1997, 1999), DLR - D. L. Robb and PMC - Dr. P.M. Catling. Voucher: TRT - Royal Ontario Museum vascular plant herbarium, SR - Sight record.

PRL*	<i>Euonymus atropurpurea</i>	SV TRT1996
	Burning Bush	
PRL*	<i>Solidago arguta</i>	SV TRT1996
	Sharp-leaved Goldenrod	
RL*	<i>Gentiana crinita</i>	SV TRT1996
	Fringed Gentian	
L*	<i>Agrostis perennans</i>	SV TRT1996
	Upland Bent Grass	
L*	<i>Andropogon gerardii</i>	PMC SR1970s
	Big Bluestem	
L*	<i>Anemone americana</i>	SVTRT1983, SR1996
	Round-lobed Hepatica	
L*	<i>Anemone quinquefolia</i>	SV TRT1983
	Wood Anemone	
L*	<i>Asclepias exaltata</i>	SV SR1996
	Poke Milkweed	
L*	<i>Aster laevis</i>	JC TRT1950
	Smooth Aster	
L	<i>Carex alopecoidea</i>	SV TRT1996
	Foxtail Sedge	
L*	<i>Carex cephalophora</i>	SV TRT1996
	Oval-headed Sedge	
L*	<i>Carex tonsa</i>	SVTRT1983, SR96
	Red-seeded Sedge	
L*	<i>Crataegus macrosperma</i>	SV SR1996
	Variable Hawthorn	
L*	<i>Crataegus pringlei</i>	SV SR1996
	Pringle's Hawthorn	
L*	<i>Corallorrhiza maculata</i>	LG TRT1948
	Spotted Coralroot	
L*	<i>Cyperus lupulinus</i>	SV TRT1996
	Slender Cyperus	
L*	<i>Cypripedium reginae</i>	SV SR1996
	Showy Lady's Slipper	
L*	<i>Desmodium nudiflorum</i>	LG TRT1948
	Naked-flowered Tick-trefoil	
L	<i>Drosera rotundifolia</i>	SV SR 1996
	Round-leaved Sundew	
L*	<i>Elymus trachycaulus</i>	SV TRT1996
	Slender Wheat Grass	
L*	<i>Gaultheria hispida</i>	SV TRT1996
	Creeping Snowberry	

L*	<i>Geranium maculatum</i>	SV TRT1996
	Spotted Crane's-bill	
L	<i>Hamamelis virginiana</i>	SV SR 1996
	Witch-hazel	
L*	<i>Heliopsis helianthoides</i>	SV TRT1996
	Sweet Ox-eye	
L	<i>Liparis loeselii</i>	SV SR 1996
	Loesel's Twayblade	
L*	<i>Lycopodium clavatum</i>	SVTRT1996
	Running Clubmoss	
L*	<i>Lycopodium hickeyi</i>	SV TRT1996
	Hickey's Ground-pine	
L*	<i>Malaxis monophylla</i>	SV TRT1996
	Adder's Mouth	
L*	<i>Oryzopsis pungens</i>	DLR TRT 1936
	Slender Mountain-rice	
L	<i>Osmunda claytoniana</i>	SV TRT1996
	Interrupted Fern	
L*	<i>Oxalis montana</i>	SV TRT1996
	Wood-sorrel	
L*	<i>Panicum columbianum</i>	SV TRT1996
	Columbia Panic Grass	
L*	<i>Panicum latifolium</i>	SV TRT1996
	Broadleaf Panic Grass	
L*	<i>Panicum linearifolium</i>	SV TRT1996
	Linear-leaved Panic Grass	
L*	<i>Panicum xanthophysum</i>	SV TRT1996
	Yellow Panic Grass	
L*	<i>Pedicularis canadensis</i>	SVTRT 1983, SR1996
	Canada Wood-betony	
L*	<i>Phegopteris connectilis</i>	SV TRT1996
	Northern Beech Fern	
L	<i>Pilea fontana</i>	SV TRT1996
	Spring Clearweed	
L*	<i>Poa languida</i>	SV TRT1996
	Languid Poa	
L*	<i>Rubus flagellaris</i>	SV SV1996
	Northern Dewberry	
L*	<i>Salix humilis</i>	SV, AG SR1996
	Upland Willow	
L*	<i>Shepherdia canadensis</i>	SV, AG SR1996
	Canada Soapberry	
L*	<i>Solidago hispida</i>	PMCTRT1970, SV SR1996
	Hairy Goldenrod	
L*	<i>Solidago squarrosa</i>	SV, AG SR1996
	Stout Goldenrod	
L*	<i>Solidago uliginosa</i>	SV TRT1996
	Bog Goldenrod	
L*	<i>Spiranthes cernua</i>	SV SR1996
	Nodding Ladies' Tresses	
L*	<i>Thelypteris noveboracensis</i>	SV SR1996
	New York Fern	
L*	<i>Vaccinium angustifolium</i>	SV SR1996
	Lowbush Blueberry	
L*	<i>Vaccinium myrtilloides</i>	SV TRT1983, SR1996
	Velvet-leaf Blueberry	

The flora of the ANSI is noteworthy for its intermixing of northern and southern species. Southern species such as Witch-hazel, Riverbank Wild Rye (*Elymus riparius*) and Burning Bush are found in drier and

warmer upland forests and openings. In contrast, northern species such as Tamarack, Balsam Fir, White Spruce, One-sided Pyrola, One-flowered Pyrola (*Moneses uniflora*), Bog Goldenrod and Blue-bead Lily are found in cooler seepage swamps and Hemlock forests.

Fauna

Jefferson Forest sustains 42 breeding bird species, with 18 considered significant (Table 3). Seventeen are noted as conservation priority species by Bird Studies Canada (Couturier 1999) and they are grouped into three major habitat types: forests, wetlands and open country. Nine of these species and an additional species, Eastern Wood-peewee, are species of concern in the Toronto and Region Conservation Authority watershed (TRCA 2001).

Eleven of the bird species are considered the most sensitive forest species in southern Ontario (Cadman 1999, Couturier 1999, Burke & Nol 1998, 2000). These species are most vulnerable to forest loss with their populations and/or viability most likely to be reduced with declining forest cover. They include Red-shouldered Hawk, Scarlet Tanager, Ovenbird, Pine Warbler, Red-breasted Nuthatch, Brown Creeper (uncommon in the TRCA watershed, pers. comm. Lionel Normand 1999), Pileated Woodpecker, Mourning Warbler, Wood Thrush, Black-billed Cuckoo and Ruffed Grouse. For example, the Pine Warbler is confined to mature White Pine forests at least 15 to 30 hectares in size, with the 4 pairs of Pine Warblers observed in the ANSI representing the largest population in the TRCA watershed (pers. comm. Lionel Normand 1999). Viable populations of Ovenbird and Wood Thrush need about 500 hectares of woodlands (Burke & Nol 1998, 2000). The Red-breasted Nuthatch needs large tracts of coniferous forest, which can include plantations (pers. comm. Lionel Normand 1999). The provincially vulnerable Red-shouldered Hawk requires large tracts of forests and associated wetlands. James Kamstra observed a year-old immature in the summer of 2000 (Gartner Lee Ltd. 2000), and local residents have observed adult Red-shouldered Hawks around the ANSI in the 1980s, during the breeding season.

Eight of these forest species and Eastern Wood-peewee are species of concern in the TRCA watershed (TRCA 2001). Many of these forest species have low numbers or are absent from urbanized portions of the watershed. American Woodcock and Ruffed Grouse are also

species of concern. Their sensitivity is attributable to their ground nesting habit and their requirement for large tracts of habitat. Another species, the recently re-introduced Wild Turkey, has similar habit requirements. The American Woodcock requires a mix of open meadows for its courtship displays and forest edge habitat for nesting. The Ruffed Grouse and Wild Turkey require large forested areas and associated regenerating lands, with the latter species also needing oak and beech forests. A combination of overhunting and loss of forest habitat extirpated the Wild Turkey from the province.

The fragmentation and loss of woodlands in the southern portion of the province has resulted in marked declines in forest interior habitat and also in the numbers of many forest bird species (Riley and Mohr 1994, OMNR 2001). Cadman (1999) has shown that in southern Ontario the number of forest bird species declines steadily below 35.5% forest cover. Such declines have also been observed elsewhere in eastern North America. In addition to the impacts of forest fragmentation, urban development has also been shown to impact negatively on forest bird species. A recent study has noted that a number of forest bird species decline when urban development occurred within 100 metres of woodlots (Friesen et al 1995). This may be attributable to predation by elevated populations of raccoons, skunks and squirrels associated with urban areas and to predation by domestic cats and dogs. Some of the sensitive forest bird species are also ground nesters or near-ground nesters, so they are especially vulnerable to nest predation.

Twelve amphibian and reptile species were found in the ANSI: Blue-spotted Salamander, Jefferson Salamander and their hybrids, Spotted Salamander, Red-spotted Newt (juvenile terrestrial or red eft stage), American Toad, Northern Spring Peeper, Tetraploid Gray Treefrog, Wood Frog, Green Frog, Leopard Frog, Eastern Garter Snake and Northern Redbelly Snake. The Jefferson Salamander is nationally threatened and it is the only record for this species in York Region. As well, there is an unconfirmed record of Four-toed Salamander (Helferty pres. comm. 2001). This locally rare, salamander was observed crossing Stouffville Road in the ANSI. It is a salamander of moist conifer forests that breeds in kettle bogs. The Blue-spotted Salamander and the Red-bellied Snake are also locally rare in the TRCA watershed, being known from 20 or less locations (Normand pers. comm. 2001).

Because there are no known breeding ponds in Jefferson Forest, woodland frogs, salamanders and toads are probably breeding in seasonally-flooded kettle wetlands north of the ANSI. Large breeding populations of these frog and salamander species are known to occur in Bond Lake & Bog ANSI, Catfish Pond EPA and the adjacent Lake Wilcox Kettle Wetlands & Uplands ANSI. They would breed in these wetlands for several weeks in the spring and then return to Jefferson Forest for the remainder of the year where they would forage and hibernate. The American Toad and Wood Frog are also known to feed in adjacent fields and agricultural lands.

Wood Frog, Gray Treefrog, Spring Peeper, Red-spotted Newt, the three salamander species and Northern Redbelly Snake are species of concern in the TRCA watershed because they are largely or entirely absent from urbanized areas. In the case of the woodland frogs and salamanders, this is attributed to the loss of wetland habitat, the loss of adjacent forests and their connecting links. Even if the wetlands and associated forests were maintained, any disruption of the connecting links by roads, fences or urban development would have serious impacts on these frog and salamander species. Northern Redbelly Snake is also known to migrate seasonally. It feeds in forests and also in adjacent fields and agricultural lands.

Eleven fish species occur in two high quality coldwater tributaries of the Rouge River. These include Brook Trout, American Brook Lamprey, Whiter Sucker, the provincially threatened Redside Dace, Longnose Dace, Fathead Minnow, Northern Redbelly Dace, Blacknose Dace, Common Shiner, Creek Chub and Johnny Darter.

Incidental mammal observations include Muskrat, Woodchuck, Eastern Chipmunk, Eastern Cottontail, Gray Squirrel, Red Squirrel, Coyote, Red Fox, Beaver, Raccoon, Striped Skunk and White-tailed Deer.

Table 3. Significant fauna

Status: T – Nationally or provincially threatened; V - Provincially vulnerable; L – Locally rare or uncommon species in the TRCA watershed occurring at 20 or less stations (pers. comm. Lionel Normand 1999, 2001); s – species of concern in the TRCA watershed (TRCA 2001); pl – conservation priority forest, wetland and open country bird species ranging from conservation priority level 1 (highest) to level 4 (lowest), based on Bird Studies Canada (Couturier 1999); f – forest bird species with the highest sensitivity to forest cover in southern Ontario (Cadman 1999, Couturier 1999, Burke & Nol 1998, 2000); and * - unconfirmed record. Breeding bird status: x – bird observed in suitable habitat during the breeding season, o – Possible breeder, P – Probable breeder. Source & Date

last seen: LN – Lionel Normand 1996 fieldwork (TRCA 1996b), NH – Natalie Helferty 2000, 2001 fieldwork (pers. com. Natalie Helferty), JK – James Kamstra (Gartner Lee Ltd. 2000), SV - Steve Varga 1996, 2001 fieldwork and for fish the 1984 and 1985 records by Steedman housed in MNR's Aurora District fish files.

Breeding Birds

V s p1 f	Red-shouldered Hawk	x	JK 2000
p3 f	Red-breasted Nuthatch	P	LN 1996
s p4	American Woodcock	P	LN 1996
s p3 f	Ruffed Grouse	P	LN 1996
s	Eastern Wood-peewee	P	LN 1996
p4	Black-capped Chickadee	P	LN 1996
s p2 f	Black-billed Cuckoo	o	LN 1996
p2 f	Pileated Woodpecker	o	LN 1996
p3	Eastern Kingbird	P	LN 1996
L s p2 f	Brown Creeper	P	LN 1996
s p4 f	Wood Thrush	P	LN 1996
s p2 f	Pine Warbler	P	LN 1996
s p4 f	Ovenbird	P	LN 1996
p2 f	Mourning Warbler	o	LN 1996
s p2 f	Scarlet Tanager	P	LN 1996
p3	Field Sparrow	P	LN 1996
p1	Savannah Sparrow	P	LN 1996
p3	American Goldfinch	P	LN 1996

Amphibians

s	Northern Spring Peeper	LN,SV 1996
s	Wood Frog	SV 1996
s	Tetraploid Gray Treefrog	NH 2000
s	Spotted Salamander	SV 2001, NH 2000
Ls	Blue-spotted Salamander	NH 2000-01
TLs	Jefferson Salamander	NH 2000-01
s	Red-spotted Newt	SV 2001
Ls	Northern Redbelly Snake	LN, SV 1996
Ls	Four-toed Salamander*	NH 2001
Fish		
Ts	Redside Dace	1984.85

Conclusions

This inventory work re-confirms that Jefferson Forest is a regional Area of Natural and Scientific Interest. The two confluent ANSIs constituting Jefferson Forest are combined into one ANSI and its former northeastern corner is now included in the provincial Lake Wilcox Kettle Wetlands & Uplands ANSI.

The ANSI is the largest natural area in the Town of Richmond Hill and one of the 14 largest forests on the Oak Ridges Moraine (OMNR 2001). Together with Lake Wilcox Kettle Wetlands & Uplands ANSI, it sustains the highest diversity of plant and animal species and the highest concentration of rare species in the Town of Richmond Hill and one of the highest on the Oak Ridges Moraine.

The ANSI fulfills the following five criteria for life science ANSI selection:

Representation

Jefferson Forest provides excellent representation of Oak Ridges Moraine sandy upland forests and organic seepage swamps and a noteworthy open seepage fen. It supports some of the largest and best examples of drier deciduous/mixed forests of Red Maple, Red Oak and White Pine on the Moraine. Other examples of these drier forests are found at Happy Valley, Lake Wilcox Kettle Wetlands & Uplands and Maple Uplands & Kettle Wetlands ANSIs. Jefferson Forest is noteworthy for its large numbers of naturally occurring White Pines, the largest such concentration known on the Moraine. Its White Cedar and Eastern Hemlock organic swamps are excellent examples of seepage fed headwater swamps on the Moraine. The only other examples are found at Happy Valley ANSI, Tyrone Valley ANSI and Glen Major ANSI.

Diversity

The ANSI is noteworthy for its diversity of over 440 vascular plant species, 42 breeding bird species, 12 reptile and amphibian species, 11 fish species and 89 vegetation community types.

Special Features

It has a high concentration of 49 significant plant species including the provincially rare Sharp-leaved Goldenrod and Burning Bush, the provincially threatened fish, Redside Dace, the nationally threatened Jefferson Salamander, the provincially vulnerable Red-shouldered Hawk and another 27 significant breeding bird, amphibian and reptile species.

Condition

The ANSI's western and southeastern portions are largely undisturbed. However, several golf course fairways occur in the southwestern portion and estate residential homes are scattered through the uplands in the northwest and northeast portions.

The ANSI's forests are largely semi-mature or intermediate-aged, with a number of trees in excess of hundred years old. There are also successional forests, plantations and regenerating lands, which are reverting to forest types typical of the moraine. The large discharge swamps and the associated coldwater streams are of high quality with little evidence of disturbance.

Ecological Function

Its forested lands are of sufficient size to support 11 sensitive forest bird species. Together with the Lake Wilcox Kettle Wetlands & Uplands ANSI to the north,

this forest block is over 500 ha in size. It is one of the 14 largest forests on the Oak Ridges Moraine and by far the largest forest in the Town of Richmond Hill. The entire forest block sustains a high diversity of 18 sensitive forest bird species, as well as 7 raptor species.

The ANSI is part of major recharge and discharge areas. Waters percolate through the highly permeable sandy soils into the aquifers of the Oak Ridges Moraine, which in turn discharge near the base of the Moraine feeding several cold water tributaries of the Rouge River watershed. The protection of natural vegetation cover on these recharge and discharge areas is critical to the Oak Ridges Moraine aquifers and to the health of the Rouge River watershed.

Recommendations

The Jefferson Forest ANSI provides excellent representation of Oak Ridges Moraine sandy upland forests and seepage swamps including a noteworthy open fen and large numbers of significant plants and animals. In light of its significance, Jefferson Forest should be protected from further impacts and disturbances.

The ANSI's sensitive recharge and discharge functions and its forest interior habitat should be protected. The estate residential development allowed into the northeast portion of the ANSI has resulted in negative impacts to the ANSI including the loss of forest interior habitat and the loss of good quality, mature forest communities.

Broad ecological corridors around Jefferson Forest need to be maintained and strengthened. Studies have shown the importance of corridors in maintaining diversity and resiliency in an ecosystem (Riley and Mohr 1994, OMNR 2000). Corridors around Jefferson Forest include one north to the Bond Lake & Bog ANSI, the Catfish Pond Environmental Protection Area and the Lake Wilcox Kettle Wetlands & Uplands ANSI. These connections are vital for the survival of Jefferson Forest's woodland frogs and salamanders. For the western population, the closest breeding ponds are the kettle wetlands around Catfish Pond, and the bog and wetlands north of Bond Lake. The eastern population probably travels to kettle wetlands in the Lake Wilcox Kettle Wetlands & Uplands ANSI and to small kettle wetlands in the midst of an agricultural field just west of this ANSI.

To the south, river corridors should also be maintained

and strengthened along two coldwater tributaries of the Rouge River. As well, to the east and west of Jefferson Forest, a broad ecological corridor should encompass a significant discharge zone and its associated wetlands, forests and streams. The discharge zone situated along the base of the Oak Ridges Moraine, is the groundwater source for the ANSI's headwater swamps and for a cluster of headwater wetlands to the east and west. The discharge zone is also a headwater source for the Rouge River watershed and its coldwater fisheries.

Woodland frogs and salamanders have been noted crossing Stouffville Road during their spring migration on their way to breeding ponds to the north. As traffic volumes on this road have increased, road mortality is having an increasing impact on amphibian populations, particularly for the nationally threatened Jefferson Salamander. Strong consideration should be given to building free span bridges or large culverts across ravine sections of Stouffville Road to minimize road kills. In the case of the Jefferson Salamander, it travels along a well-defined ravine migration route through the eastern portion of the ANSI, crosses the road and then heads into Lake Wilcox Kettle Wetlands & Uplands ANSI.

Encouragement should be given to phasing out the conifer plantations scattered through the ANSI. For example, selective removal would speed up the regeneration of native tree species in the understorey.

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Jefferson Forest Area of Natural and Scientific Interest

NOTE

The information displayed on this map has been compiled from various sources. While every effort has been made to accurately depict the information, this map should be viewed as illustrative only.

For detailed information on the ANSI, the individual files held by the Aurora District Office of the Ministry of Natural Resources should be consulted.

Information Provided by the Ministry of Natural Resources,
Aurora District, Aurora, Ontario

Base Information derived from the Ontario Base Map, 1983,
scale 1:10,000, Peterborough, Ontario

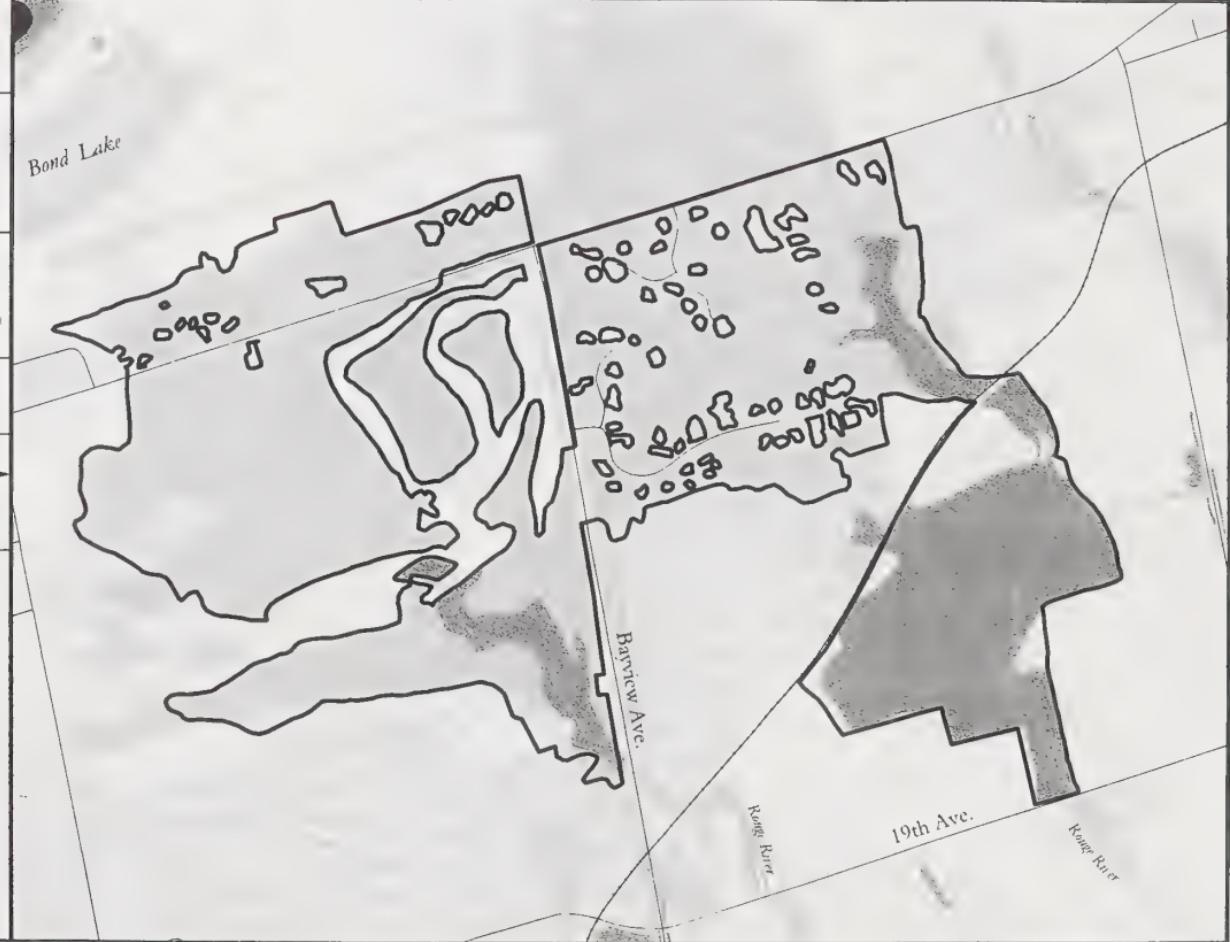
© Published May 10, 2000
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Printed in Ontario, Canada

Scale 1:12,000 (Approx.)

200 0 200 400 M

Legend

- Area of Natural and Scientific Interest (ANSI)
- Woodland
- Regenerating Land
- Wetland
- Kettle Bog
- Kettle Lake
- Intermittent Stream
- Cold Water Stream
- Urban Area
- Contour Line
(5 metre interval)
- Road
- Railway



INVENTORY OF THE LAKE WILCOX KETTLE WETLANDS & UPLANDS AREA OF NATURAL AND SCIENTIFIC INTEREST

**Ontario Ministry of Natural Resources, Southern Region
Aurora District
May 2001**

OBM Map: 10 17 6150 48650; **NTS Map:** 30M/14

UTM Reference: 621000 4861000

Latitude: 43° 57' **Longitude:** 79° 25'; **Area:** 182 ha

Aerial Photographs: 1:10,000, MNR, 1978, Roll 48, Line & No. 43: 4366: 287-290; 1:24,000, 10 May 1992, Roll 033, Line & No. 12: 28-30; 1:10,000 infrared, MNR, 1997, Roll: 38, No.: 6683-6685, 6491-6494.

Municipality, Lots & Concessions: Regional Municipality of York, Town of Richmond Hill, : Lots 3-6, Conc. 2.

General Location: northern portion of Richmond Hill, east of Wilcox Lake, south and north of Bethesda Sideroad and east of Bayview Avenue.

Ownership: private

Site District: 6E7

Date of Investigations: 1981, 1983, 1996: August 26, 29, Oct. 2, 3; 1997: April 22, 28, May 26, 29, June 7, 14, 20, July 16, 17, 31 August 7, 14, 29; 2000: May 22; 2001: April 26.

Investigators: MNR: Steve Varga, Karen Mewa, Heather Murdie and Ramana Thambipillai; TRCA: Lionel Normand; Sheila McKay-Kuja assisted with 1983 fieldwork.

Compiler: Steve Varga

Introduction

The Lake Wilcox Kettle Wetlands & Uplands ANSI occurs on the Oak Ridges Moraine in the northern portion of Richmond Hill. The Moraine is noteworthy for its extensive forests and diverse wetlands that range from headwater swamps to kettle bogs and kettle lakes. Its scenic hills stretch east for 160 km from the Niagara Escarpment through the heart of the Greater Toronto Area to beyond Rice Lake.

This inventory is part of an ongoing effort to re-examine and update Areas of Natural and Scientific Interest (ANSIs) on the Oak Ridges Moraine (site district 6E7) (Lindsay 1984). As part of this re-examination, additional natural areas such as kettle lakes were inventoried for possible ANSI status. Emphasis was given to kettle lakes and kettle bogs, because they were under-represented in the original selection of ANSIs on the Moraine.

The fieldwork for Lake Wilcox Kettle Wetlands & Uplands ANSI was done in partnership with the Toronto and Region Conservation Authority. This inventory also incorporates the biological work of Anthony Goodban (McCormick and Rankin Corp. 1997), Gore and Storrie (1993), TRCA (1982), and an earlier wetland evaluation (OMNR 1987).

This site was identified in 1984 as a regional life science Area of Natural and Scientific Interest (ANSI). It was selected for its representation of kettle wetlands in Site District 6E7, an area covering the Oak Ridges Moraine (Lindsay 1984).

The wetlands in the ANSI are part of the provincially significant Wilcox - St. George Wetland Complex (OMNR 1998). As well, the ANSI has been identified as an Environmentally Significant Area (ESA) by TRCA. York Region has identified the site as an Environmental Policy Area, a Wetland, a Significant Forested Land and part of a Regional Greenlands System in their 1994 Official Plan.

Physiography

The Oak Ridges Moraine is one of the province's largest moraines, rising up to 300 metres above the surrounding lake plains. The Moraine was created under and between the margins of two glacial ice sheets. Meltwaters deposited huge amounts of sands, silts and gravels in a large lake now occupied by the Moraine (Barnett et al 1998).

An east-west trending band across the central portion of the Moraine supports hundreds of small depressional wetlands or kettles. This band extends from the Town of Caledon East in northeastern Peel through King Township, Richmond Hill and Whitchurch-Stouffville in York Region to the hamlets of Goodwood and Glen Major in western Durham Region. These kettles were created during the last de-glaciation. Many of the resulting depressions became ponds and lakes. The smaller ones filled with plant debris and gradually succeeded into marshes, thicket swamps and bogs. The larger depressions remained as lakes.

The northern half of Lake Wilcox Kettle Wetlands & Uplands ANSI, consists of vigorously rolling fine sands and silts with numerous depressions or isolated kettles. Some of these depressions are dry while twenty kettles support a wide variety of wetlands on organic deposits. The three largest kettles include a 1.6 ha kettle sustaining a floating peat bog surrounded by an open moat. Another kettle has the 2.8 ha Swan Lake fringed by wetlands and a second bog. A third kettle, north of

Bethesda Sideroad and 5 ha in size, sustains wetlands and a third bog.

The central portion of the ANSI is relatively flat and is covered in glacial Halton till deposits of calcareous silts with loamy soils underlain by thick sand deposits.

The southern half of the ANSI, like the northern portion, consists of vigorously rolling morainal deposits of fine sands and some gravels. Two major dry valleys bisect this area.

The ANSI's permeable morainal deposits are part of a significant recharge area for the Moraine's aquifers (Hunter and Assoc. with Raven Beck Environ. Ltd 1996). The two dry valleys, south of the ANSI, support coldwater Rouge River streams that emanate from the Moraine's upper aquifer along discharge zones. In the ANSI, the eastern dry valley supports an intermittent stream that flows for about 250 metres in the upper, side portion of the valley before disappearing into the main valley floor.

Vegetation

Lake Wilcox Kettle Wetlands & Uplands supports a high diversity of 65 vegetation community types (Table 1). Most common are moist to drier upland forests and kettle wetlands.

Moist forests of Sugar Maple dominate the central portion of the ANSI on relatively flat terrain covered in silty soils. American Beech is also a common secondary tree species. The understorey consists of White Trillium (*Trillium grandiflorum*), Yellow Trout-lily (*Erythronium americanum*) and Blue Cohosh (*Caulophyllum giganteum*), with scattered Wild Ginger (*Asarum canadense*), Virginia Waterleaf (*Hydrophyllum virginianum*), Enchanter's Nightshade (*Circaeа lutetiana*), Early Meadow-rue (*Thalictrum dioicum*), Yellow Violet (*Viola pubescens*) and Jack-in-the-Pulpit (*Arisaema triphyllum*).

In the north-central and south-central portions of the ANSI, cool depressions and northerly slopes support moist mixed forests dominated by Eastern Hemlock with White Pine, White Birch, Sugar Maple and Beech as secondary tree species or co-dominants. The shade cast by the Hemlocks results in a sparser herb understorey than those found in the deciduous forests. The forest floor is dominated by ferns such as Evergreen Wood Fern (*Dryopteris intermedia*), Spinulose Wood Fern (*Dryopteris carthusiana*) and Marginal Shield Fern (*Dryopteris marginalis*) and by

such herbs as Rose-twisted Stalk (*Streptopus roseus*), Blue-bead Lily (*Clintonia borealis*), Peduncled Sedge (*Carex pedunculata*) and Wild Lily-of-the-Valley (*Maianthemum canadense*).

Drier deciduous/mixed forests are concentrated on ridges and on warmer southeast facing slopes such as those on the west side of the northcentral bog and in the southern corner of the ANSI. These forests are dominated by Red Oak with such strong secondary species as Red Maple, Sugar Maple and White Pine. Occasionally Red Maple and White Pine are the dominant tree species, while in other stands Red Maple, Sugar Maple and sometimes White Birch dominate the tree layer. The understorey, especially in the drier more open stands, has a common tall shrub layer of Beaked Hazel (*Corylus cornuta*), Witch Hazel (*Hamamelis virginiana*) and Round-leaved Dogwood (*Cornus rugosa*) and low shrubs of Maple-leaved Viburnum (*Viburnum acerifolium*) and Chokeberry (*Prunus virginiana*). The herb layer in these forests are dominated by Wild Sarsaparilla (*Aralia nudicaulis*), Bracken Fern (*Pteridium aquilinum*) Pennsylvania Sedge (*Carex pensylvanica*), Large-leaved Aster (*Aster macrophyllus*), Blue-stem Goldenrod (*Solidago caesia*), White Trillium and Pointed-leaved Tick-trefoil (*Desmodium glutinosum*).

Small openings in the oak forests are dominated by Poverty Oat Grass (*Danthonia spicata*) and Canada Blue Grass (*Poa compressa*) with scattered Pennsylvania Sedge, Bracken Fern, Showy Tick-trefoil (*Desmodium canadense*), Sheep Sorrel (*Rumex acetosella*) and Wild Bergamot (*Monarda fistulosa*). These openings sustain a high concentration of significant plant species including Slender Cyperus (*Cyperus lupulinus*), Red-seeded Sedge (*Carex rugosperma*), Upland Willow (*Salix humilis*), Pinweed (*Lechea intermedia*) and Linear-leaved Panic Grass (*Panicum linearifolium*).

Successional deciduous forests occur scattered through the ANSI, especially around the kettle wetlands in the northwest portion. Stands are variously dominated by Large-toothed Aspen, Trembling Aspen, White Birch, Black Cherry, White Ash and, in one stand, Balsam Poplar. There is also a mixed successional forest of Large-toothed Aspen with scattered White Pine, White Birch and Red Oak. The drier stands dominated by the aspens and White Birch have a dense tall shrub layer of Round-leaved Dogwood, Common Buckthorn (*Rhamnus cathartica*) and Beaked Hazel, with an understorey of Poison Ivy (*Rhus radicans*), Wild

Sarsaparilla, Large-leaved Aster and Blue-stem Goldenrod. The moister Balsam Poplar, White Ash and Black Cherry stands have a shrub layer of Common Buckthorn.

A regenerating field with thickets of Staghorn Sumac (*Rhus typhina*), hawthorn and Common Buckthorn and groves of Trembling Aspen provides a critical link between the kettle wetlands and associated uplands in the northwestern and northeastern portions of the ANSI. Regenerating fields also cover the head of the dry valley in the southwest corner of the ANSI.

Twenty kettle wetlands are scattered throughout the northern half of the ANSI. Most of these wetlands are flooded in the spring and experience a drawdown in the summer, with some of the more shallow and smaller kettles drying out by the summer.

Common in these wetlands are thicket swamps dominated by willows such as Shining Willow (*Salix lucida*), Slender Willow (*Salix petiolaris*), Pussy Willow (*Salix discolor*) and Missouri Willow (*Salix eriocephala*) as well as Red-osier Dogwood and Winterberry (*Ilex verticillata*). Below the shrub layer there is a rich herb layer dominated by Common Duckweed (*Lemna minor*), Sensitive Fern (*Onoclea sensibilis*), Water-parsnip (*Sium sauve*), Cinnamon Fern (*Osmunda cinnamomea*), Spotted Jewelweed (*Impatiens capensis*) and Water Horsetail (*Equisetum fluviatile*).

Several kettles, and the occasional openings in the thicket swamps, sustain marshes and meadow marshes of Water-parsnip, Common Cattail (*Typha latifolia*), Reed Canary Grass (*Phalaris arundinacea*) and, in one kettle, Three-parted Beggars-ticks (*Bidens tripartita*) and Rice Cut Grass (*Leersia oryzoides*).

A few scattered deciduous swamps in the kettle wetlands are dominated by Red Maple, Silver Maple and Hybrid Willow (*Salix Xrubens*). Common in the understorey are Red-osier Dogwood, Sensitive Fern, Cinnamon Fern and Spotted Jewelweed. One mixed swamp in the northcentral portion of the ANSI sustains a mixture of White Cedar, Balsam Fir, Hemlock, Yellow Birch and Red Maple with an understorey of Sensitive Fern.

Swan Lake in the northeast corner of the ANSI has 2.8 hectares of open water with Bullhead Pond-lily (*Nuphar variegata*) and Large-leaved Pondweed

(*Potamogeton amplifolius*) beds ringed by a low thicket swamp of Water-willow (*Decodon verticillatus*).

The ANSI is renowned for its three kettle bogs. The bogs are more appropriately called kettle peatlands because they have species typical of more acidic bogs mixed with those typical of more neutral fens. The kettle peatlands on the Moraine probably have more affinities with poor fens than true acid bogs.

The largest bog, a one-hectare kettle in the north-central portion of the ANSI, supports a central floating bog ringed by an open water moat of Common Duckweed. There is a shrub bog of Leatherleaf (*Chamaedaphne calyculata*) and a graminoid bog of Three-way Sedge (*Dulichium arundinaceum*) and Water Arum (*Calla palustris*). This bog also formerly supported a treed bog of White Pine and Tamarack however, these trees have died out over the past decade with scattered saplings and seedlings still common. The tree die back may be due to higher water levels brought on by a series of wetter years.

A second bog in the midst of a thicket swamp in the northern corner of the ANSI, north of Bethesda Road, sustains a treed bog of Red Maple and Tamarack with scattered tall shrubs of Mountain Holly (*Nemopanthus mucronatus*), Winterberry and a low shrub layer of Leatherleaf.

A third bog on the south side of the Swan Lake kettle contains a treed bog of White Pine and Red Maple with a shrub understorey of Winterberry and Leatherleaf. This understorey also dominates in a shrub bog where the trees have died back over the past decade, again possibly brought on by wetter years.

Table 1. Vegetation community types

Dominant species in a community are noted in bold.

Wetland Community Types

1. Open Water Aquatics
 - a. Common Duckweed
 - b. Bullhead Pond-lily - Large-leaved Pondweed
2. Mineral Meadow Marsh
 - a. Sensitive Fern - Spotted Jewelweed
 - b. Three-parted Beggar's-ticks – Rice Cut Grass
3. Organic Meadow Marsh:
Reed Canary Grass
4. Mineral Marsh:
Common Cattail
5. Organic Marsh
 - a. Common Cattail
 - b. Cyperus-like Sedge
 - c. Water-parsnip
6. Mineral Thicket Swamp:
Red-osier Dogwood - Spotted Jewelweed

7. Organic Thicket Swamp

- Shining Willow - Winterberry
- Shining Willow - Winterberry - Missouri Willow
- Shining Willow - Missouri Willow - Red-osier Dogwood
- Missouri Willow - Red-osier Dogwood
- Pussy Willow - Narrow-leaved MeadowSweet
- Pussy Willow
- Slender Willow
- Red-osier Dogwood - Shining Willow - Slender Willow
- Red-osier Dogwood - Winterberry - Sensitive Fern - Cinnamon Fern**
- Winterberry - Sensitive Fern - Cinnamon Fern**
- Water-willow

8. Mineral Deciduous Swamp

- Silver Maple - Red-osier Dogwood - Sensitive Fern
- Hybrid Willow - Red-osier Dogwood - Spotted Jewelweed

9. Organic Deciduous Swamp

- Red Maple - Winterberry - Cinnamon Fern - Sensitive Fern**
- Red Maple - Red-osier Dogwood - Sensitive Fern - Cinnamon Fern**

10. Organic Mixed Swamp:

White Cedar - Balsam Fir - Hemlock - Red Maple - Yellow Birch - Sensitive Fern

11. Treed Kettle Bog

- White Pine - Red Maple - Winterberry - Leatherleaf - Cinnamon Fern - Sphagnum sp.
- Red Maple - Tamarack - Winterberry - Mountain Holly - Leatherleaf - Three-way Sedge - Sensitive Fern

12. Shrub Kettle Bog

- Winterberry - Leatherleaf - Three-way Sedge - Water Arum - Sphagnum sp.
- Leatherleaf - Water Arum - Sphagnum sp.

13. Graminoid Kettle Bog:

Three-way Sedge - Water Arum - Sphagnum sp.

Terrestrial Community Types

14. Fresh-Moist Deciduous Forest:

- Sugar Maple
- Sugar Maple - Beech**
- Sugar Maple - White Birch**

15. Dry-Fresh Deciduous Forest

- Red Oak - Sugar Maple
- Sugar Maple - Red Maple**
- Sugar Maple - Red Maple - White Birch**
- Red Maple - Sugar Maple
- Red Maple - White Birch

16. Fresh-Moist Mixed Forest

- Sugar Maple - White Birch - Eastern Hemlock**
- Eastern Hemlock - White Birch - Sugar Maple**
- Eastern Hemlock - White Birch**
- Eastern Hemlock - White Pine - Sugar Maple**
- Eastern Hemlock - Sugar Maple - Beech**
- Eastern Hemlock - White Pine - Red Maple - Sugar Maple - Beech**

17. Dry-Fresh Mixed Forest

- Red Oak - Sugar Maple - Red Maple - White Pine
- White Pine - Red Oak - Sugar Maple - Red Maple**
- Red Oak - White Pine - Red Maple**
- White Pine - Red Maple - Sugar Maple - Beech**

18. Successional Deciduous Forest

- Large-toothed Aspen - Red Maple - Black Cherry
- Large-toothed Aspen
- Balsam Poplar

- Trembling Aspen
- White Birch - Trembling Aspen
- White Birch - Trembling Aspen - Red Oak**
- White Birch - Red Maple - Trembling Aspen - Large-toothed Aspen**
- White Ash - Black Cherry
- White Ash

19. Successional Mixed Forest

Large-toothed Aspen - White Pine - White Birch - Red Oak

Cultural Community Types

20. Conifer Plantation

- Red Pine - White Spruce
- Scots Pine - White Spruce - White Cedar
- White Cedar
- Red Pine - Scots Pine
- Scots Pine - Red Pine - White Pine

21. Thicket

- Staghorn Sumac
- Hawthorn
- Common Buckthorn

22. Regenerating Field

- Tall Goldenrod
- Poverty Oat Grass
- Canada Blue Grass

Flora

Lake Wilcox Kettle Wetlands & Uplands ANSI supports a high diversity of 436 vascular plant species, with a noteworthy concentration of 68 significant flora (Table 2). There is the provincially rare White Fringed Orchid (*Platanthera blephariglottis*) and Sharp-leaved Goldenrod (*Solidago arguta*), the regionally rare Ontario Aster (*Aster ontario*) and Yellow Water Buttercup (*Ranunculus flabellaris*) (Riley 1989), and 64 species that are rare in the Ontario Ministry of Natural Resources' site district 6E7 (Varga et al. 2001). The region is defined as the Ontario Ministry of Natural Resources' former Central Region which covers the Greater Toronto Area and the regional municipalities of Simcoe, Dufferin, Waterloo, Hamilton - Wentworth and Niagara. Site district 6E7 covers the entire Oak Ridges Moraine, the abutting South Slopes and a section of the Niagara Escarpment.

These 68 rare species occur in a wide variety of habitats. Twenty-nine species are restricted to the upland forests with 25 species occurring in drier deciduous/mixed forests and associated openings, four in moist Eastern Hemlock mixed forests and two in moist Sugar Maple deciduous forests. The other 37 rare species are restricted to its kettle wetlands with 22 species largely confined to the three bogs. Four species are restricted to Swan Lake and the remaining 11 species are found in a variety of kettle swamps and marshes. Three historic species of the ANSI's bogs, Dwarf Mistletoe (*Arceuthobium pusillum*), Moccasin

confined to the three bogs. Three additional historic species of the ANSI's bogs, Dwarf Mistletoe (*Arceuthobium pusillum*), Moccasin Flower (*Cypripedium acaule*) and the provincially rare White Fringed Orchid have not been seen recently. Another four aquatic species are restricted to Swan Lake and the remaining 11 species are found in a variety of kettle swamps and marshes.

Table 2. Significant vascular plants

Status: P - Provincially rare (Oldham 1999); R - Regionally rare (former OMNR Central Region, based on Riley (1989a)); L - Locally rare in OMNR site district 6E7 (based on Varga et al 2001); * - Species also rare in the Regional Municipality of York. Source & date: SV - Steve Varga (1981, 1983, 1996, 1997, 2000), DR - D.W.A. Roberts, GS - Gore and Storrie 1992 fieldwork (Gore & Storrie 1993), DG - Anthony Goodban 1996 fieldwork (McCormick Rankin Corp. 1997), EC - E.H. Craigie, HB - H.H. Brown, PK - P.V. Krotkov, WB - W.K.W. Baldwin, WS - W. Scott, Voucher: TRT - Royal Ontario Museum vascular plant herbarium, SR - Sight record.

PRL*	<i>Platanthera blephariglottis</i>	TRT1905, HB TRT1929	L*	<i>Corallorrhiza maculata</i>	SV SR1996
	White Fringed Orchid			Spotted Coral-root	
PRL*	<i>Solidago arguta</i>	SV TRT1980, 1997	L*	<i>Crataegus macrosperma</i>	SV TRT1996
	Sharp-leaved Goldenrod			Variable Hawthorn	
RL*	<i>Aster ontarionis</i>	SV TRT1997	L*	<i>Crataegus pringlei</i>	SV SR1996
	Ontario Aster			Pringle's Hawthorn	
RL*	<i>Ranunculus flabellaris</i>	SV TRT1996	L*	<i>Cyperus lupulinus</i>	SV TRT1996
	Yellow Water Buttercup			Slender Cyperus	
L*	<i>Andromeda glaucophylla</i>	HB TRT1929, SV TRT1997	L*	<i>Cypripedium acaule</i>	WB TRT1932
	Bog Rosemary			Moccasin Flower	
L*	<i>Agrostis perennans</i>	SV SR1997	L*	<i>Decodon verticillatus</i>	SV TRT1997
	Upland Bent Grass			Water-willow	
L*	<i>Arceuthobium pusillum</i>	PK TRT1931	L*	<i>Diphaziastrum tristachyum</i>	SR TRT1996
	Dwarf Mistletoe			Blue Ground-cedar	
L*	<i>Aronia prunifolia</i>	SV TRT1997	L	<i>Drosera rotundifolia</i>	SV SR1997
	Chokeberry			Round-leaved Sundew	
L*	<i>Asclepias exaltata</i>	SV SR1996	L*	<i>Dulichium arundinaceum</i>	SV TRT1980, 1997
	Poke Milkweed			Three-way Sedge	
L*	<i>Betula pumila</i>	GS SR1992	L*	<i>Elymus trachycaulus</i>	SV SR1996
	Swamp Birch			Slender Wheat Grass	
L*	<i>Calystegia spithamea</i>	SV TRT1981	L*	<i>Eriophorum vaginatum</i>	DR TRT1939
	Low Bindweed			Dense Cotton-grass	
L*	<i>Carex atherodes</i>	SV TRT1996	L*	<i>Eriophorum virginicum</i>	DR TRT1939, SV TRT80, 97
	Awned Sedge			Tawny Cotton-grass	
L*	<i>Carex brunneocans</i>	SV TRT1997	L*	<i>Elymus riparius</i>	SV TRT1996
	Brownish Sedge			River-bank Wild-rye	
L*	<i>Carex canescens</i>	SV TRT1997	L*	<i>Gaylussacia baccata</i>	SV TRT1980, 1997
	Silvery Sedge			Black Huckleberry	
L*	<i>Carex cephalophora</i>	SV SR1996	L*	<i>Galearis spectabilis</i>	SV SR1997
	Oval-headed Sedge			Showy Orchis	
L*	<i>Carex echinata</i>	SV TRT1997	L*	<i>Glyceria canadensis</i>	SV TRT1997
	Little Prickly Sedge			Rattlesnake Manna Grass	
L*	<i>Carex magellanica</i>	SV TRT1997	L*	<i>Glyceria septentrionalis</i>	SV TRT1997
	Stunted Sedge		L	<i>Hamamelis virginiana</i>	SV SR1997
L*	<i>Carex molesta</i>	SV TRT1996		Witch-hazel	
	Troublesome Sedge		L*	<i>Kalmia polifolia</i>	HB TRT1929, SV TRT1980, SR97
L*	<i>Carex tonsa</i>	SV TRT1996		Bog Laurel	
	Red-seeded Sedge		L*	<i>Lechea intermedia</i>	AG SR1996
L*	<i>Chamaedaphne calyculata</i>	HB TRT1929, SV TRT80, 97		Pinweed	
	Leatherleaf		L*	<i>Ledum groenlandicum</i>	DR TRT1939, 40, SV TRT80, 97
L*	<i>Cirsium discolor</i>	AG SR1997		Labrador Tea	
	Field Thistle		L*	<i>Leersia virginica</i>	GS SR1992
				White Grass	
			L*	<i>Lonicera hirsuta</i>	SV SR2000
				Hairy Honeysuckle	
			L*	<i>Lycopodium hickeyi</i>	SV TRT1980, 83, SR97
				Hickey's Ground-pine	
			L*	<i>Moneses uniflora</i>	SV SR1996, TDD & JM SR1996
				One-flowered Pyrola	
			L*	<i>Nemopanthus mucronata</i>	WS TRT1910, SV TRT80, 97
				Mountain Holly	
			L	<i>Nuphar variegata</i>	SV SR1997
				Bullhead Pond-lily	
			L	<i>Nymphaea odorata</i>	SV SR1997
				White Water-lily	
			L*	<i>Panicum linearifolium</i>	SV TRT1996
				Linear-leaved Panic Grass	
			L*	<i>Panicum latifolium</i>	SV TRT1996
				Broad-leaved Panic Grass	
			L*	<i>Picea mariana</i>	SV TRT1980, SR1997
				Black Spruce	
			L	<i>Pilea fontana</i>	SV TRT1996
				Spring Clearweed	

L*	<i>Potamogeton amplifolius</i>	SV TRT1997
L	Large-leaved Pondweed	
L	<i>Potentilla palustris</i>	SV SR1997
L	Marsh Cinquefoil	
L*	<i>Ribes glandulosum</i>	SVTRT1983
L	Skunk Currant	
L*	<i>Salix humilis</i>	SV SR1996
L	Upland Willow	
L*	<i>Salix pedicellaris</i>	SV TRT1997
L	Bog Willow	
L*	<i>Sarracenia purpurea</i>	SV TRT1980, 97
L	Pitcher-plant	
L*	<i>Shepherdia canadensis</i>	SV TRT1997
L	Canada Soapberry	
L*	<i>Solidago squarrosa</i>	SV SR1996
L	Stout Goldenrod	
L*	<i>Vaccinium angustifolium</i>	SV SR1997
L	Lowbush Blueberry	
L*	<i>Vaccinium myrtilloides</i>	SV TRT1980, 97
L	Velvet-leaf Blueberry	
L*	<i>Vaccinium oxycoccus</i>	SV TRT1980
L	Small Cranberry	
L*	<i>Veronica scutellata</i>	SV TRT1997
L	Marsh Speedwell	
L*	<i>Viburnum cassinoides</i>	SV TRT1983
L	Wild Raisin	
L*	<i>Viburnum lantanoides</i>	SV TRT1983, SR1997
L	Hobblebush	
L*	<i>Viburnum rafinesquianum</i>	SV SR1997
L	Downy Arrow-wood	

The ANSI flora is noteworthy for having a large number of 22 bog and fen species. They include Leatherleaf, Moccasin Flower, Swamp Birch (*Betula pumila*), Small Cranberry (*Vaccinium oxycoccus*), Velvet-leaf Blueberry (*Vaccinium myrtilloides*), Chokeberry (*Aronia prunifolia*), Pitcher-plant (*Sarracenia purpurea*), Labrador Tea (*Ledum groenlandicum*), Bog Laurel (*Kalmia polifolia*), Dwarf Mistletoe, Black Huckleberry (*Gaylussacia baccata*), Mountain Holly, Bog Rosemary, Black Spruce (*Picea mariana*), Dense Cotton-grass (*Eriophorum vaginatum*), Tawny Cotton-grass (*Eriophorum virginicum*), Round-leaved Sundew (*Drosera rotundifolia*), Little Prickly Sedge, White Bog Orchid, Bog Willow, Marsh Cinquefoil (*Potentilla palustris*) and Tamarack. All but the last species is considered rare on the Oak Ridges Moraine (site district 6E7), as one would expect, since bog habitat is also rare.

Fauna

The ANSI sustains 53 breeding bird species, with 25 of them significant species (Table 3). Twenty-four are conservation priority bird species in forest, wetland and open country habitats based on Bird Studies Canada (Couturier 1999). Ten of these species, plus Eastern Wood-peewee, are species of concern in the Toronto and Region Conservation Authority watershed (TRCA 2001). They include rare species as well as species that

are forest or area-sensitive species and those indicative of good quality undisturbed wetlands. Many of these sensitive species have low numbers or are absent from urbanized portions of the watershed. Five species are also rare or uncommon in the TRCA watershed being known from 20 or less stations (pers. comm. Lionel Normand 1999).

The ANSI is noteworthy for its diversity of 13 sensitive forest bird species. These breeding birds have the highest sensitivity to forest cover in southern Ontario (Cadman 1999, Couturier 1999, Burke & Nol 1998, 2000). They include Barred Owl, Northern Goshawk, Broad-winged Hawk, Red-breasted Nuthatch, Northern Waterthrush, Ruffed Grouse, Brown Creeper, American Redstart, Veery, Ovenbird, White-throated Sparrow, Wood Thrush and Scarlet Tanager. For example, Ruffed Grouse requires large forested areas and associated regenerating lands and Red-breasted Nuthatch need large tracts of coniferous forests and/or plantations. Viable populations of Ovenbird and Wood Thrush need about 500 hectares of woodlands (Burke & Nol 1998, 2000).

The fragmentation and loss of woodlands in the southern portion of the province and in eastern North America has resulted in marked declines in forest interior habitat and also in the numbers of many forest bird species (Riley & Mohr 1994). Cadman 1999 has shown that in southern Ontario the number of forest bird species declines steadily below 35.5% forest cover. In addition to the impacts of forest fragmentation, urban development has also been shown to impact negatively on forest bird species. A recent study has noted that a number of forest bird species declined when urban development occurred within 100 metres of woodlots (Friesen et al 1995). This decline may be attributable to increased nest predation by elevated populations of raccoons, skunks and squirrels associated with urban areas, and to predation by domestic cats and dogs. Some of the sensitive forest bird species are also ground or near ground nesters so they are especially vulnerable to nest predation.

The kettle wetlands are home to Northern Waterthrush and Virginia Rail, wetland species of concern that are indicative of sites of low disturbance and high quality. Wood Duck and Swamp Sparrow are also conservation priority wetland species. While the field habitats have such significant birds as Bobolink, Vesper Sparrow and Savannah Sparrow.

A high diversity of twelve amphibian and reptile species occur in the ANSI, including American Toad, Spotted, Blue-spotted and Jefferson Salamanders, Western Chorus Frog, Northern Spring Peeper, Tetraploid Gray Treefrog, Green Frog, Wood Frog, Eastern Garter Snake, Midland Painted Turtle and Northern Leopard Frog. The Jefferson Salamander is nationally threatened, and it is the only record for this species in York Region. The Blue-spotted Salamander is locally rare (Normand pers. comm. 2001).

Noteworthy are the large numbers of breeding woodland frogs such as Wood Frog, Spring Peeper, Treefrog and Chorus Frog and the salamanders. They are all species of concern in the TRCA watershed being largely or entirely absent from urbanized areas. This is attributable to the loss of wetland habitat, the loss of adjacent forests and their connecting corridors. These woodland amphibians require spring-flooded wetlands for breeding and forested habitats for feeding and hibernating. Some of the woodland frog and salamander populations were found in the forests in the southern portion of the ANSI. Because this area lacks any breeding ponds, its populations would have to travel hundreds of meters to small kettle wetlands in an agricultural field that partially divides the northern and southern halves of the ANSI. They may also travel further north to the numerous kettle wetlands in the northern half of the ANSI.

Incidental observations were made of 13 mammal species including Woodchuck, Eastern Cottontail, Deer Mouse, Eastern Chipmunk, Red Fox, Raccoon, European Hare, Striped Skunk, Muskrat, Coyote, Red Squirrel, Grey Squirrel and White-tailed Deer.

Table 3. Significant fauna

Status: P - Nationally threatened; L - locally rare or uncommon in the TRCA watershed being known from 20 or less stations (pres. comm. Lionel Normand 1999, 2001); s - species of concern in the TRCA watershed (TRCA 2001); p1 - conservation priority forest, wetland and open country bird species ranging from conservation priority level 1 (highest) to level 4 (lowest), based on Bird Studies Canada (Couturier 1999); f - forest bird species with the highest sensitivity to forest cover in southern Ontario (Cadman 1999, Couturier 1999, Burke & Nol 1998, 2000). Breeding bird status: C - Confirmed breeders, P - Probable breeder, o - Possible breeder; x - bird observed in suitable habitat during the breeding season. Source: Gore and Storrie 1992 fieldwork (Gore and Storrie 1993), Steve Varga 1997, 2000 & 2001 fieldwork, Lionel Normand 1997 fieldwork (TRCA 1997), Natalie Helferty 2000, 2001 fieldwork (pers. comm. Natalie Helferty).

Breeding Birds

p4	Wood Duck	C	1997
L s p2 f	Northern Goshawk	C	1997
L s p2 f	Broad-winged Hawk	x	1997

L s p1 f	Barred Owl	o	1997
p2f	Pileated Woodpecker	o	2000
s	Eastern Wood-peewee	P	1997
p2	Swamp Sparrow	o	1997, 1992
L s p2 f	Brown Creeper	o	1997, 1992
L s p2 f	White-throated Sparrow	o	1992
p3	Field Sparrow	P	1997
p1	Savannah Sparrow	P	1997
p3	Vesper Sparrow	P	1997, 1992
s p2	Bobolink	P	1997
p3 f	Red-breasted Nuthatch	P	1997, 1992
s p2 f	Northern Waterthrush	x	1982
s p3 f	Ruffed Grouse	o	1997
s p1	Virginia Rail	o	1997
s p4 f	Ovenbird	o	1997
p4	Black-capped Chickadee	C	1997
p4	Gray Catbird	P	1997
p3	Eastern Kingbird	P	1997
s p4 f	Wood Thrush	P	1997, 1992
s p3 f	Veery	o	1992
s p2 f	Scarlet Tanager	P	1997, 1992
s p2 f	American Redstart	o	1997
Amphibians			
s	Wood Frog		1997, 1992
s	Northern Spring Peeper		1997
s	Spotted Salamander		1997
Ls	Blue-spotted Salamander		SV 2001, NH2000-01
Tls	Jefferson Salamander		SV 2001, NH2000-01
s	Tetraploid Gray Treefrog		1997
s	Western Chorus Frog		SV 2000

Conclusions

This inventory work and a comparative study of kettle bogs and lakes provides the basis for elevating the Lake Wilcox Kettle Wetlands & Uplands from a regional to a provincial Area of Natural and Scientific Interest. Its boundaries incorporate a forested block that was formerly part of Jefferson Forest ANSI. This forest block is noted for its high quality dry and moist upland forests. Its inclusion into the Lake Wilcox Kettle Wetlands & Uplands ANSI adds to its representation and diversity.

The ANSI supports an excellent representation of kettle wetlands, including three rare kettle bogs. These are the most diverse and largest assemblage of kettle wetlands for any ANSI on the Oak Ridges Moraine. The kettle bogs sustain a diversity of bog types, including graminoid, shrub and treed bogs that have a high concentration of 22 bog and fen species. The only other bogs currently in a provincial ANSI include the Moraine's largest closed kettle bog at Bond Lake & Bog, an open kettle bog fringing Vandorf Lake, and the small lakeside bog in Philips Lake ANSI. Kettle bogs are recognised as a provincially rare community type (Bakowsky 1996). They are more appropriately called kettle peatlands because they occur on thick organic deposits that have floristic affinities with both acid bogs

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L s p2 f	White-throated Sparrow	o	1992
p3	Field Sparrow	P	1997
p1	Savannah Sparrow	P	1997
p3	Vesper Sparrow	P	1997, 1992
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p3 f	Red-breasted Nuthatch	P	1997, 1992
s p2 f	Northern Waterthrush	x	1982
s p3 f	Ruffed Grouse	o	1997
s p1	Virginia Rail	o	1997
s p4 f	Ovenbird	o	1997
p4	Black-capped Chickadee	C	1997
p4	Gray Catbird	P	1997
p3	Eastern Kingbird	P	1997
s p4 f	Wood Thrush	P	1997, 1992
s p3 f	Veery	o	1992
s p2 f	Scarlet Tanager	P	1997, 1992
s p2 f	American Redstart	o	1997

Amphibians

s	Wood Frog	1997, 1992
s	Northern Spring Peeper	1997
s	Spotted Salamander	1997
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and more neutral fens. The Moraine's kettle peatlands have closest affinities to poor fens. This is probably due to the calcareous soils on the Moraine in contrast to the generally acidic substrates of northern Ontario.

The ANSI's Swan Lake is an example of an isolated kettle lake type. Such lakes have no water flowing out and the only inflows are precipitation and surface runoff. These lakes also have very small watersheds or catchments that may just be several times the size of the lake. Only twelve of the 32 lakes on the Moraine fall into this isolated kettle lake type. Of these, five are over 10 hectares in size and another six vary from 2 to 7 hectares. Swan Lake is an example of one of those six small isolated lakes. Swan Lake and Vandorf Lake in Vandorf ANSI are considered the two best examples of these small isolated kettle lakes. Both have relatively little development around their shores and their watersheds are largely forested. Swan Lake is noted for its open water aquatic community and Water-willow low shrub swamp that grades to the south into a treed and shrub bog. The only other example of a water-willow low shrub swamp, a rare community type on the Moraine, occurs at Lake St. George ANSI.

Lake Wilcox Kettle Wetlands & Uplands also sustain a good representation of moist Sugar Maple and Eastern Hemlock forests and drier Red Oak, Red Maple and White Pine forests. Its drier deciduous and mixed forests and associated openings are some of the best examples on the Moraine and are noted for their high concentration of significant species.

The ANSI fulfills the following five criteria for life science ANSI selection:

Representation

The ANSI provides excellent representation of Oak Ridges Moraine natural features. There is a diverse array of kettle wetlands including thicket swamps and marshes, deciduous and mixed swamps, three bogs and a kettle lake. This is the most diverse example of kettle wetlands for any ANSI on the Moraine. There is also good representation of moist deciduous/mixed upland forests and excellent representation of drier deciduous/mixed forests. The drier Red Oak, White Pine and Red Maple forests and associated dry sandy openings are some of the best examples on the Moraine.

Diversity

The ANSI has a high diversity of 436 vascular plant species, 53 breeding bird species, 12 amphibian and

reptile species and 65 vegetation communities, especially when one considers its relatively small size of 96 hectares.

Special Features

It has a very high concentration of 68 significant plant species and 32 significant bird and amphibian species, including the provincially rare Sharp-leaved Goldenrod and White Fringed Orchid and the nationally threatened Jefferson Salamander. This is one of the largest number of significant plants noted for any ANSI on the Oak Ridges Moraine.

Its three kettle bogs or kettle peatlands are a provincially rare community type. They occupy less than 0.02% of the Moraine, and bogs and fens are known to cover less than 0.01% of southern Ontario (Riley 1989b). On the Oak Ridges Moraine there are 33 kettle bogs covering a total of only 45 hectares (OMNR 2001).

Swan Lake is considered a rare ecosystem in southern Ontario and site district 6E7. On the Moraine there are only 32 kettle lakes covering about 307 ha, less than 0.2% of the Moraine's surface (OMNR 2001).

Condition

The ANSI's kettle wetlands are of high quality with no disturbances evident. The 2.8 ha Swan Lake is also of high quality with only one residence on its north side away from the lake and a small dock. However, some water quality declines have been noted for the lake over the past few decades.

The forests are largely semi-mature or intermediate-aged, with a number of trees in excess of hundred years old. There are also successional forests and regenerating lands, which are reverting to forest types typical of the moraine.

The European exotic shrub, Common Buckthorn, is invading the forest understoreys in the northwestern corner of the ANSI. Motorized bikes have also disturbed portions of the regenerating lands in the northwestern portion of the ANSI with trails also radiating out into the forested areas.

Ecological Function

Its forested lands are confluent with the adjacent Jefferson Forest ANSI, comprising a large forested block of over 500 hectares. The forest is one of the 14 largest woodlands on the Oak Ridges Moraine and the largest in the Town of Richmond Hill (OMNR 2001).

The entire forest supports 18 forest sensitive bird species (13 in the ANSI) as well as 7 nesting raptor species (all but two in the ANSI).

The ANSI is part of a significant recharge area. Drainage in this area is mostly internal with water percolating through permeable soils into the moraine's aquifers and the Humber and Rouge River watersheds.

The protection of the recharge area's natural vegetation cover is critical to the Oak Ridges Moraine's aquifers and to the health of the Rouge and Humber watersheds.

Recommendations

The scenic Lake Wilcox Kettle Wetlands & Uplands ANSI provides excellent representation of Oak Ridges Moraine natural features. The rolling upland forests and its kettle wetlands and kettle lake are noteworthy for their quality and their high concentration of rare flora and fauna. The ANSI's three kettle bogs or peatlands are recognised as a provincially rare community type. The twenty kettle wetlands represent the largest and most diverse example of kettle wetlands for any ANSI on the Moraine.

The kettle wetlands, including its kettle bogs and Swan Lake, have small surface catchment basins. The wetlands are reliant on precipitation and surface runoff and because they have no surface outflows, any contaminants that get into them are not flushed out. Because of this, the kettle wetlands are extremely sensitive to development, water taking and nutrient inputs. The low nutrient status of the bogs makes them even more susceptible to nutrient inputs. Due to their sensitivity and significance, development in the surface catchments of the kettle wetlands would have negative impact on ANSI values. Protection should also be afforded to the groundwater catchments of the kettles.

To further ensure the protection of the ANSI's kettle wetlands, reforestation and natural regeneration should be encouraged in the remainder of their surface catchment basins. Most of the kettles are already well forested, however, forest cover still needs to be encouraged around Swan Lake, the kettle wetland and the bog north of Betheseda Sideroad and the kettle wetlands in the northwest corner of the ANSI.

Increased forest cover in the catchment basin of Swan Lake would also help to stabilize water quality declines observed for the lake. Improvements could also be achieved by reducing or eliminating agricultural runoff and converting lawns to natural vegetation.

Broad ecological corridors around Lake Wilcox Kettle Wetlands & Uplands need to be maintained and strengthened. Studies have shown the importance of corridors in maintaining diversity and resiliency in an ecosystem (Riley and Mohr 1994, OMNR 2000). Connections include one to the south and west with Jefferson Forest and Bond Lake & Bog ANSIs. To the southeast, a broad dry valley provides a good corridor to a coldwater stream of the Rouge River. To the northwest, there is a broad link with the Lake St. George ANSI and to the northeast with Haynes Lake and beyond. There are also connections to the east with several kettle wetlands and a second tributary of the Rouge River.

The connection between the northern and southern half of the ANSI is presently only a hedgerow. This connection could be greatly strengthened by encouraging the reforestation of surrounding agricultural fields, particularly the one in the central-western portion of the ANSI. This field contains kettle wetlands used as breeding ponds by the ANSIs resident woodland frogs and salamanders and they function as a corridor for others travelling between the kettle wetlands of the northern half of the ANSI and the forests of the southern half.

Woodland frogs and salamanders have been noted crossing Stouffville Road from Jefferson Forest ANSI during their spring migration on their way to breeding ponds in the Lake Wilcox Kettle Wetlands & Uplands ANSI or adjacent to it. As traffic volumes on this road have increased, road mortality is having an increasing impact on amphibian populations, particularly for the nationally threatened Jefferson Salamander. Strong consideration should be given to building free span bridges or large culverts across ravine sections of Stouffville Road to minimize road kills. In the case of the Jefferson Salamander, it travels along a well-defined ravine migration route through the eastern portion of the Jefferson Forest ANSI, crosses the road and then heads into the Lake Wilcox ANSI.

To minimize disturbance to the fragile sandy soils and hills of the ANSI, consideration should be given to phasing out access for motorized trail bikes and ATVs. Serious consideration should also be given to the removal of invasive exotic plants in the ANSI. The area of greatest concern occurs in the northwestern corner of the ANSI where the European shrub, Common Buckthorn, has become common in the forest understorey.

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Lake Wilcox Kettle Wetlands and Uplands Area of Natural and Scientific Interest

NOTE:
The information contained in this map has been compiled to
accord with specific information that may be required
as detailed only.

For detailed information on the AONI, the technical files
of the Ministry of Natural Resources should be consulted.

Information provided by the Ministry of Natural Resources
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Printed in Canada

Scale 1:12,000 (Approx.)

200 0 200 400 m

Legend

■ Area of Natural and Scientific
Interest (ANSI)

□ Woodland

□ Regulating Land

□ Water

□ Kettle Bog

— Intermittent Stream

— Cold Water Stream

□ Urban Area

□ Contour Line
(5 meter interval)

— Road

— Railways

Leslie St.

Stouffville Rd.

11 acres
11 acres

Lake Wilcox
Kettle
Cove

INVENTORY OF THE BOND LAKE & BOG AREA OF NATURAL AND SCIENTIFIC INTEREST

Ontario Ministry of Natural Resources

Aurora District

May 2001

OBM Map: 10 17 6200 48650, 6250 48650; **NTS Map:** 30M/14
UTM Reference: 624400 4865900

Latitude: 43° 56' **Longitude:** 79° 27'; **Area:** 49 ha

Aerial Photographs: 1:10,000, MNR, 1978, Roll 49, Line & No. 43: 4365; 413-415; 1:24,000, 10 May 1992, Roll 033, Line & No. 12: 26-27; 1:10,000 infrared, MNR, 1997, Roll: 38, No.: 6494-9495.

Municipality, Lots & Concessions: Regional Municipality of York, Town of Richmond Hill, Whitchurch Geographic Township: Lots 62-64, Conc. 1 EYS; King Geographic Township: Lots 62-63, Conc. 1 WYS; Ontario Ministry of Natural Resources

Southern Region, Aurora District

General Location: northern portion of Richmond Hill, north of Stouffville Road and east of Yonge Street

Site District: 6E7

Ownership: private

Date of Investigation: 1981, 1983, 1996: Oct. 3; 1997: April 30, May 20, 29, June 2 and September 3

Investigators: TRCA: Lionel Normand; MNR: Steve Varga, Mark Heaton and Deborah Metsger assisted with the 1983 fieldwork.

Compiler: Steve Varga

Introduction

The Bond Lake & Bog occurs on the Oak Ridges Moraine in the northern portion of Richmond Hill. The Moraine is noteworthy for its extensive forests and diverse wetlands that range from headwater swamps to kettle bogs and kettle lakes. Its scenic hills stretch east for 160 km from the Niagara Escarpment through the heart of the Greater Toronto Area to beyond Rice Lake.

This inventory is part of an ongoing effort to re-examine and update Areas of Natural and Scientific Interest (ANSIs) on the Oak Ridges Moraine (site district 6E7) (Lindsay 1984). As part of this re-examination, additional natural areas such as kettle lakes were inventoried for possible ANSI status. Emphasis was given to kettle lakes and kettle bogs, because they were underrepresented in the original selection of ANSIs on the Moraine.

The fieldwork for Bond Lake & Bog was done in partnership with the Toronto and Region Conservation Authority. This inventory also incorporates the faunal and floral work undertaken by Gore and Storrie (1993), Michael Michalski Associates (1999), ESG (1999), TRCA (1982) and an earlier wetland evaluation of the bog (OMNR 1987).

The bog portion of the site was identified in 1984 as a regional Area of Natural and Scientific Interest (ANSI). It was selected for its representation of a kettle bog in Site District 6E7, an area covering the Oak Ridges Moraine (Lindsay 1984). The Ministry has also identified the bog and the wetlands in Bond Lake as part of the provincially significant Philips - Bond - Thompson Wetland Complex (OMNR 1998).

As well, the Toronto and Region Conservation Authority has identified the site as an Environmentally Significant Area. It is also identified as an Environmental Policy Area, a Wetland, a Significant Forested Land and part of a Regional Greenlands System in York Region's 1994 Official Plan.

Physiography

The Oak Ridges Moraine is one of the province's largest moraines, rising up to 300 metres above the surrounding lake plains. The Moraine was created under and between the margins of two glacial ice sheets. Meltwaters deposited huge amounts of sands, silts and gravels in a large lake now occupied by the Moraine (Barnett et al 1998).

An east-west trending band across the central portion of the Moraine supports hundreds of small depressional wetlands or kettles. This band extends from the Town of Caledon East in northeastern Peel through King Township, Richmond Hill and Whitchurch-Stouffville in York Region to the hamlets of Goodwood and Glen Major in western Durham Region. These kettles were created during the last de-glaciation and many support ponds and lakes. The smaller ones filled with plant matter and gradually succeeded into marshes, thicket swamps and bogs. The larger depressions remained as lakes.

Two of these kettles are well represented at the Bond Lake & Bog ANSI. The largest depression, Bond Lake is 17.8 ha in size and is the deepest kettle lake on the Moraine. The lake is "L" shaped with a shallow northwestern arm less than 3 metre deep. The main body of the lake quickly deepens from shore with its three deepest pockets ranging from 15, 24 to 29 metres.

Bond Lake is situated on the edge of a ridge that lines the southern side of a broad morainal valley of the East Humber River. The surrounding kettle slopes of the lake rise another 17 metres above the lake surface making the entire kettle 46 metres deep and covering 73.8 hectares. Bond Lake is one of 32 kettle lakes on the Moraine that range in size from 2 ha to 49 ha. They represent one of the largest concentrations of kettle lakes in southern Ontario.

To the north, a smaller 17 ha kettle sustains a 6 ha kettle bog and surrounding moat that sits on deep peats. The kettle is partially situated on the Humber valley floor so its slopes are only 3 metres high on the north side of the bog, while its south slopes, on the morainal ridge, rise up 15 metres. Kettle bogs such as those in the ANSI are known from only 33 kettles on the Moraine (OMNR 2001). This is one of the largest concentrations of kettle bogs in southern Ontario.

Both kettles in the ANSI are isolated, although there is some intermittent flow between the bog and lake. The only water coming to these kettles is precipitation and surface runoff from the surrounding slopes. There is likely a shallow groundwater contribution to these kettles from a perched aquifer in the Halton Till (Hunter pers. comm. 2001). Discharge would be primarily in the spring and is probably more prevalent from the northern side of the kettles.

The steep upper slopes around Bond Lake and its associated bog support forests and regenerating fields on calcareous till loams of the Halton Till underlain by thick sand deposits. The ANSI's permeable morainal deposits are part of a significant recharge area for the Moraine's aquifers (Hunter and Assoc. with Raven Beck Environ. Ltd 1996).

Vegetation

The Bond Lake & Bog ANSI supports 21 vegetation community types (Table 1) ranging from open water aquatics to kettle bogs, moist Eastern Hemlock and drier Red Oak forests.

Bond Lake, in its shallow northwestern bay, sustains emergent marshes of Common Cattail (*Typha latifolia*) and Water Horsetail (*Equisetum fluviatile*) associated with White Water-lily (*Nymphaea odorata*), Leafy Pondweed (*Potamogeton foliosus*) and Flat-stemmed Pondweed (*Potamogeton zosteriformis*). The lake edge is ringed by open water floating and submergent beds dominated by White Water-lily, Large-leaved Pondweed (*Potagometon amplifolius*), Eurasian Water

Milfoil (*Myriophyllum spicatum*), Flat-stemmed Pondweed, Water-marigold (*Megalodonta beckii*), Common Coontail (*Ceratophyllum demersum*), Bullhead Pond-lily (*Nuphar variegata*), Leafy Pondweed and Water-shield (*Brasenia schreberi*).

The ANSI is renowned for its 4 ha kettle bog supporting a floating closed bog ringed by an open water moat and thicket swamp. The bog is more appropriately called a kettle peatland because it has species typical of more acidic bogs mixed with those typical of more neutral fens. The kettle peatlands on the Moraine probably have more affinities with poor fens than true acid bogs.

The bog has two shrub bog types encircling a central treed bog. Tamarack and Black Spruce dominate the treed bog. Below, there is a low shrub layer of Leatherleaf (*Chamaedaphne calyculata*), a dense Sphagnum moss carpet and scattered herbs and sedges of Three-way Sedge (*Dulichium arundinaceum*), Pitcher-plant (*Sarracenia purpurea*), Three-leaved Solomon's-seal (*Maianthemum trifolium*), Mud Sedge (*Carex limosa*) and Tufted Loosestrife (*Lysimachia thyrsiflora*). Around the treed bog there is a shrub bog of Leatherleaf with scattered saplings of Tamarack and Black Spruce and a dense carpet of Sphagnum moss. As well, in the western portion of the shrub bog, there are clumps of Common Cattail, and elsewhere there are patches of Lake Sedge (*Carex lacustris*), Tawny Cotton-grass (*Eriophorum virginicum*) and Three-leaved Solomon's-seal.

The moat around the bog supports an open water aquatic community of Floating Pondweed (*Potamogeton natans*), Common Duckweed (*Lemna minor*), and Green-fruited Burreed (*Sparganium emersum*). Along the fringe of this moat there are Lake Sedge marshes and thicket swamps of Winterberry (*Ilex verticillatus*), Narrow-leaved Meadowsweet (*Spiraea alba*) and Pussy Willow (*Salix discolor*). Below the shrubs there is an understorey of Lake Sedge and scattered Tussock Sedge (*Carex stricta*), Marsh Cinquefoil (*Potentilla palustris*), Canada Blue-joint (*Calamagrostis canadensis*), Hairy Sedge (*Carex lasiocarpa*) and Marsh Fern (*Thelypteris palustris*).

The ANSI supports several other small wetlands, including a seepage meadow marsh of Spotted Jewelweed (*Impatiens capensis*) on the east side of the lake and a Common Cattail marsh in a small kettle on the ridge between the lake and bog.

The slopes around the lake and bog are dominated by semi-mature mixed/conifer forests on the northfacing slopes, and deciduous/mixed forests on the southfacing slopes.

The cooler northfacing conifer forests are dominated by Eastern Hemlock with occasional stands of White Cedar on steeper slopes. Secondary tree species include White Pine, Sugar Maple and Beech. In one mixed stand, Sugar Maple co-dominates with Eastern Hemlock. The dense shade cast by the hemlocks and cedars results in an understorey dominated by Evergreen Wood Fern (*Dryopteris intermedia*) and Wild Sarsaparilla (*Aralia nudicaulis*), with scattered Wild Lily-of-the-Valley (*Maianthemum canadense*), Marginal Wood Fern (*Dryopteris marginalis*) and Blue-stem Goldenrod (*Solidago caesia*).

The warmer southfacing slopes are dominated by Sugar Maple, while the drier, steeper slopes and ridges are dominated by Red Oak, occasionally with White Pine, a common secondary or co-dominant tree species. Frequent in the understorey are such shrubs as Chokecherry (*Prunus virginiana*) and Bush-honeysuckle (*Diervilla lonicera*) and such herbs as White Trillium (*Trillium grandiflorum*), Yellow Trout-lily (*Erythronium americanum*), Large-leaved Aster (*Aster macrophyllus*) and Blue-stem Goldenrod.

There are also a few successional deciduous forests on the north side of the bog and the northwestern corner of the lake. They are dominated by White Birch, Trembling Aspen and Balsam Poplar with Common Buckthorn (*Rhamnus cathartica*) as a common understorey shrub.

Other minor terrestrial communities present in the ANSI include a few small conifer plantations, some Staghorn Sumac (*Rhus typhina*) thickets and regenerating fields, particularly on the west side of the lake. The ridge top along the divide between the lake and bog supports regenerating fields, a small kettle wetland and a central agricultural field.

Table 1. Vegetation community types

Wetland Community Types

1. Open Water Aquatics
 - a. Eurasian Water Milfoil - Large-leaved Pondweed - White Water-lily - Bullhead Pond-lily - Water-marigold - Common Cattail - Flat-stemmed Pondweed
 - b. Floating Pondweed - Green-fruited Burreed - Common Duckweed
2. Mineral Meadow Marsh: Spotted Jewelweed
3. Mineral Marsh
 - a. Common Cattail

- b. Water Horsetail - White Water-lily - Flat-stemmed Pondweed - Slender Pondweed
4. Organic Marsh: Lake Sedge
5. Organic Thicket Swamp:
 - Winterberry - Pussy Willow - Narrow-leaved Meadowsweet - Lake Sedge
6. Treed Kettle Bog:
 - Tamarack - Black Spruce - Leatherleaf
7. Shrub Kettle Bog
 - a. Leatherleaf - Three-leaved Solomon's-seal - Lake Sedge - Tawny Cotton-grass
 - b. Leatherleaf - Common Cattail

Terrestrial Community Types

9. Fresh Deciduous Forest: Sugar Maple
10. Dry-Fresh Deciduous Forest
 - Red Oak** - Sugar Maple
11. Moist-Fresh Mixed Forest:
 - Sugar Maple - Eastern Hemlock
12. Dry-Fresh Mixed Forest:
 - Red Oak - White Pine
13. Moist-Fresh Conifer Forest
 - a. **Eastern Hemlock** - White Pine
 - b. **White Cedar** - Eastern Hemlock
14. Successional Deciduous Forest
 - a. White Birch - Trembling Aspen
 - b. Balsam Poplar

Cultural Community Types

15. Conifer Plantation
16. Thicket: Staghorn Sumac
17. Regenerating Field

Flora

The Bond Lake & Bog ANSI supports 353 vascular plant species, with a high concentration of 54 significant flora (Table 2). There are two species, Few-flowered Sedge (*Carex tenuiflora*) and Rough Cotton-grass (*Eriophorum tenellum*), that are rare in the Ontario Ministry of Natural Resources' former Central Region. This region encompasses the Greater Toronto Area and the regional municipalities of Simcoe, Dufferin Waterloo, Hamilton-Wentworth and Niagara (Riley 1989). Both species occur in the kettle bog and they are known from only one other site on the Oak Ridges Moraine and in the Greater Toronto Area.

Another 52 species are rare in the Ontario Ministry of Natural Resources' site district 6E7, an area covering the Oak Ridges Moraine as well as the adjacent South Slope and a portion of the Niagara Escarpment (Varga et al. 2001). These significant species are found in the kettle bog and lake, with the exception of Pringle's Hawthorn (*Crataegus pringlei*), Variable Hawthorn (*C. macrosperma*), Hairy Goldenrod (*Solidago hispida*) and Upland Bent Grass (*Agrostis perennans*) that occur on southfacing Red Oak slopes. Historical records for Pinweed (*Lechea intermedia*), Canada Hawkweed (*Hieracium canadense*), Canada Soapberry (*Shepherdia canadensis*) and Round-lobed Hepatica (*Anemone americanum*) also probably occurred in drier

oak forests and openings. Most of the wetland species noted historically are still present, although Rose Pogonia (*Pogonia ophioglossoides*), Creeping Snowberry (*Gaultheria hispidula*) and Arum-leaved Arrowhead (*Sagittaria cuneata*) have not been seen recently.

Table 2. Significant vascular plants

Status: R - Regionally rare (former OMNR Central Region, based on Riley (1989a)); L - Locally rare in site OMNR district 6E7 an area centred on the Oak Ridges Moraine (based on Varga et al 2001) * - Species also rare in the Regional Municipality of York. Source & date: SV - Steve Varga 1981, 1983, 1996, 1997 fieldwork, DG - Dan Gregory 1996 fieldwork (Michael Michalski 1999), GS - Gore & Storrie 1992 fieldwork (Gore & Storrie 1993) and historical collections from EC - E.H. Craigie, HB - H.H. Brown, MW - M. Wilkes, WS - W. Scott, DD & JM - D. Dorland & J. Meininger, JW - J. White and TI - T.J. Ivey; Voucher: TRT - Royal Ontario Museum vascular plant herbarium, SR - Sight record.

RL*	<i>Carex tenuiflora</i>	SV TRT1997	<i>Eriophorum vaginatum</i>	SV TRT1981, SR1997
	Few-flowered Sedge		Dense Cotton-grass	
RL*	<i>Eriophorum tenellum</i>	SV TRT1981, SR1997	<i>Eriophorum virginicum</i>	SV TRT1981, SR1997
	Rough Cotton-grass		Tawny Cotton-grass	
L*	<i>Agrostis perennans</i>	SV SR1997	<i>Gaultheria hispida</i>	MV TRT1900
	Upland Bent Grass		Creeping Snowberry	
L	<i>Alopecurus aequalis</i>	SV SR1997	<i>Glyceria septentrionalis</i>	SV TRT1997
	Short-awned Foxtail		Eastern Mannagrass	
L*	<i>Andromeda polifolia</i>	SV SR1997	<i>Hieracium canadense</i>	TI TRT1909
	Bog Rosemary		Canada Hawkweed	
L*	<i>Anemone americanum</i>	HB TRT1939	<i>Kalmia polifolia</i>	MW TRT1901, SV TRT1981, SR97
	Round-lobed Hepatica		Bog Laurel	
L*	<i>Aronia prunifolia</i>	SV TRT 1981, SR1997	<i>Lechea intermedia</i>	HB TRT1946
	Chokeberry		Pinweed	
L*	<i>Bidens discoidea</i>	SV TRT1997	<i>Ledum groenlandicum</i>	SV TRT 1981, SR1997
	Small Beggar-ticks		Labrador Tea	
L*	<i>Brasenia shreberi</i>	JW, WS TRT1910, SV TRT1983	<i>Megalodontia beckii</i>	SV TRT1983, 1996
	Water-shield		Water-marigold	
L*	<i>Carex echinata</i>	SV TRT1997	<i>Menyanthes trifoliata</i>	SV TRT1981, SR1997
	Little Prickly Sedge		Bog Buckbean	
L*	<i>Carex lasiocarpa</i>	SV TRT1981, 1997	<i>Nemopanthus mucronata</i>	WS TRT1908, SV TRT81, SR97
	Hairy Sedge		Mountain Holly	
L*	<i>Carex limosa</i>	SV TRT1981, SR1997	<i>Nuphar variegata</i>	SV TRT1996
	Mud Sedge		Bullhead Pond-lily	
L*	<i>Carex magellanica</i>	SV TRT1981, SR1997	<i>Nymphaea odorata</i>	SV TRT1996
	Stunted Sedge		White Water-lily	
L*	<i>Carex utriculata</i>	SV TRT1981, SR1997	<i>Picea mariana</i>	SV SR1997
	Beaked Sedge		Black Spruce	
L	<i>Ceratophyllum demersum</i>	SV SR1997	<i>Pogonia ophioglossoides</i>	WS TRT1911
	Common Coontail		Rose Pogonia	
L*	<i>Chamaedaphne calyculata</i>	EC1910, SV TRT1981, SR97	<i>Potamogeton amplifolius</i>	SV TRT1996
	Leatherleaf		Large-leaved Pondweed	
L*	<i>Crataegus macrosperma</i>	SV SR2000	<i>Potamogeton gramineus</i>	SV TRT1996
	Variable Hawthorn		Variable Pondweed	
L*	<i>Crataegus pringlei</i>	SV SR2000	<i>Potamogeton illinoensis</i>	SV TRT1996, 1997
	Pringle's Hawthorn		Illinois Pondweed	
L	<i>Drosera rotundifolia</i>	SV TRT1981, SR1997	<i>Potamogeton richardsonii</i>	SV SR1997
	Round-leaved Sundew		Richardson's Pondweed	
L*	<i>Decodon verticillatus</i>	GS SR1992	<i>Potentilla palustris</i>	SV TRT 1981, SR1997
	Water-willow		Marsh Cinquefoil	
L*	<i>Dulichium arundinaceum</i>	SV TRT1981, SR1997	<i>Sagittaria cuneata</i>	JW TRT1910
	Three-way Sedge		Arum-leaved Arrowhead	
L	<i>Elodea canadensis</i>	SV TRT1981, SR1997	<i>Salix pedicellaris</i>	SV TRT1981, SR1997
	Canada Waterweed		Bog Willow	

The ANSI flora is noteworthy for its 25 bog and fen species, the largest such total for any bog on the Oak Ridges Moraine. These include Leatherleaf, Bog Rosemary (*Andromeda polifolia*), Velvet-leaf Blueberry (*Vaccinium myrtilloides*), Small Cranberry (*Vaccinium oxycoccus*), Bog Goldenrod (*Solidago uliginosa*), Chokeberry (*Aronia prunifolia*), Pitcher-plant, Bog Laurel (*Kalmia polifolia*), Labrador Tea (*Ledum groenlandicum*), Mountain Holly (*Nemopanthus mucronata*), Black Spruce (*Picea mariana*), Dense Cotton-grass (*Eriophorum vaginatum*), Rough Cotton-grass, Tawny Cotton-grass, Stunted Sedge (*Carex magellanica*), Few-flowered Sedge, Round-leaved Sundew (*Drosera rotundifolia*), Little Prickly Sedge (*Carex echinata*), Bog Willow (*Salix pedicellaris*), Rose Pogonia, Bog Buckbean (*Menyanthes trifoliata*), Mud Sedge, Marsh Cinquefoil and Tamarack. With the exception of the last species these are all rare on the Oak Ridges Moraine, as one would expect because their kettle bog habitat is also rare.

Fauna

The ANSI sustains 47 breeding bird species of which 20 are significant species (Table 3). 19 of these bird species are considered conservation priority birds for forest, wetland and open country habitats in southern Ontario by Bird Studies Canada (Couturier 1999). Six of these species and an additional species, Eastern Wood-peewee, are considered species of concern in the Toronto and Region Conservation Authority watershed (TRCA 2001). They include rare species as well as species that are forest or field area-sensitive species and those indicative of good quality undisturbed wetlands. Many of these sensitive species have low numbers or are absent from urbanized portions of the TRCA watershed.

Despite its small size, the forests around the lake and bog support 6 sensitive forest bird species: Mourning Warbler, Ruffed Grouse, Red-breasted Nuthatch, Wood Thrush, Northern Waterthrush and Scarlet Tanager. These species have the highest sensitivity to forest cover in southern Ontario (Cadman 1999, Couturier 1999, Burke & Nol 2000). Their presence may be due to the proximity of a large 500 ha forested block just 300 metres to the south in the Jefferson Forest ANSI. For example, Red-breasted Nuthatch needs large tracts of coniferous forest, which can include plantations, while the sensitive Ruffed Grouse requires large forested areas and associated regenerating lands. Burke & Nol (2000) note that

viable populations of Wood Thrush need about 500 hectares of woodlands.

The fragmentation and loss of woodlands in the southern portion of the province and elsewhere in eastern North America has resulted in marked declines in forest interior habitat and also in the number of many forest bird species (Riley and Mohr 1994). Cadman (1999) has shown that in southern Ontario the number of forest bird species declines steadily below 35.5% forest cover. In addition to forest fragmentation, urban development has been shown to impact negatively on forest birds. A recent study has shown that a number of forest bird species have declined when urban development occurred within 100 metres of woodlots (Friesen et al 1995). This decline may be attributable to nest predation by elevated populations of raccoons, skunks and squirrels associated with urban areas and to predation by domestic cats and dogs.

Blue-winged Teal and Northern Waterthrush are wetland species of concern in the TRCA watershed. Other wetland species such as Swamp Sparrow and Wood Duck are also conservation priority species. Vesper Sparrow a species of field habitats is another conservation priority species.

Nine amphibian and reptile species were found in the ANSI: American Toad, Northern Spring Peeper, Frog, Green Frog, Tetraploid Gray Treefrog, Wood Frog, Northern Leopard Frog, Common Snapping Turtle, Midland Painted Turtle and Eastern Garter Snake. Most noteworthy are the large breeding populations of Spring Peepers, Wood Frogs and Gray Treefrogs which breed in the open water moat around the bog and in two wetlands north of the ANSI.

Woodland frogs require wetlands in the spring for breeding and nearby forested habitats for feeding and hibernating. The woodland frog populations reside in the ANSI's forests, others probably reside in the adjacent Jefferson Forest ANSI which lacks its own breeding ponds. The Jefferson Forest populations would be travelling across fields and hedgerows to the Bond Lake Bog and the wetlands to the north. In the TRCA watershed these 3 woodland frogs are considered species of concern because they are largely or entirely absent from urbanized areas (Table 3). This is attributable to the loss of wetland habitat, the loss of adjacent forests and their connecting links.

Other wetland species dependent on upland habitats include Midland Painted Turtles and Common

Snapping Turtles, which while resident in the lake, lay their eggs in fields around the lake. Waterfowl such as Mallard and Blue-winged Teal nest in fields around the lake and Wood Duck nest in trees around the lake. The Leopard Frogs and Toads rely on the surrounding fields and agricultural lands for foraging, with the toads also using the surrounding forests.

Bond Lake currently supports a fish community of six species including Northern Pike, Brown Bullhead, Pumpkinseed, Banded Killifish, Golden Shiner and Iowa Darter. Brook Trout were plentiful in the lake in 1935 and White Sucker was last observed in 1970. The introduction of Northern Pike from Lake Simcoe may be the cause of the disappearance of Brook Trout. As the deepest lake on the Moraine, its waters are cold enough and rich enough in oxygen to support coldwater species even during the late summer. 1996 and 1999 temperature and dissolved oxygen profiles indicate that the lake is capable of supporting coldwater species such as Brook Trout. Coldwater species would probably be limited to a depth of 7 to 10 metres in late summer due to the oxygen depletion at depths greater than 11 metres. Further habitat assessment is needed to determine whether adequate spawning shoals exist in the lake. Based on the historic fish community, documented oxygen profiles and water temperature profiles, the lake is classified as coldwater.

Incidental observations were made of 10 mammal species including Eastern Cottontail, Grey Squirrel, Raccoon, Coyote, Striped Skunk, Red Squirrel, Red Fox, Woodchuck, Eastern Chipmunk and White-tailed Deer.

Table 3. Significant fauna

Status: s - species of concern in the TRCA watershed (TRCA 2001); p1 – conservation priority forest, wetland and open country bird species ranging from conservation priority level 1 (highest) to level 4 (lowest), based on Bird Studies Canada (Couturier 1999); f – forest bird species with the highest sensitivity to forest cover in southern Ontario (Cadman 1999, Couturier 1999, Burke & Nol 1998, 2000). Breeding bird status: P – Probable breeder, o – Possible breeder. Source: 1992 fieldwork (Gore and Storrie 1993), 1997 fieldwork Lionel Normand (TRCA 1997) and Natalie Helferty (2000).

Breeding Birds

s p3	Blue-winged Teal	o	1997
s p3 f	Ruffed Grouse	o	1997, 1992
p4	Black-capped Chickadee	P	1997, 1992
s	Eastern Wood-peewee	o	1997
p3 f	Red-breasted Nuthatch	o	1997, 1992
p4	Gray Catbird	o	1997, 1992
p4	Spotted Sandpiper	P	1997
p3 f	Eastern Phoebe	o	1992
p3	Eastern Kingbird	o	1997, 1992
p4	Barn Swallow	o	1997

s p2 f	Northern Waterthrush	o	1992
p2	Swamp Sparrow	P	1997, 1992
p3	Vesper Sparrow	o	1992
p4	Wood Duck	P	1997, 1992
p2 f	Mourning Warbler	o	1997
s p3	Yellow-billed Cuckoo	o	1992
p3	Eastern Phoebe	o	1992
s p4 f	Wood Thrush	o	1997
s p2 f	Scarlet Tanager	o	1992
p3	American Goldfinch	P	1997, 1992

Amphibians			
s	Northern Spring Peeper		1997
s	Wood Frog		1997
s	Tetraploid Gray Treefrog		2000

Conclusions

This inventory work provides the basis for elevating Bond Lake & Bog to a provincial Area of Natural and Scientific Interest. Formerly a regional ANSI, which just covered the bog, the ANSI has been extended to include Bond Lake and its associated forests and upland ridge. The ANSI has been elevated to provincial status because it supports two rare features inadequately represented in provincial ANSIs on the Oak Ridges Moraine: closed kettle bogs and kettle lakes.

The ANSI supports the largest closed kettle bog on the moraine, with the highest concentration of bog and fen flora on the Oak Ridges Moraine. The only other bogs currently in a provincial ANSI include Philips Lake, Lake Wilcox Kettle Wetlands & Uplands and Vandorf. Kettle bogs are recognised as a provincially rare community type (Bakowsky 1996). They are more appropriately called kettle peatlands because they occur on thick organic deposits that have floristic affinities with both northern acid bogs and more neutral fens. The Moraine's kettle peatlands have closest affinities to poor fens. This is probably due to the calcareous soils on the Moraine in contrast to the generally acidic substrates of northern Ontario.

Bond Lake is noted for its rich aquatic vegetation communities and its concentration of significant species. Kettle lakes on the Oak Ridges Moraine can be divided into two types: headwater kettle lakes and isolated kettle lakes. Headwater kettle lakes are situated on headwater streams. Mary, St. George, Hackett and Thompson (King Twp.) lakes are the best examples of these headwater kettle lakes.

Bond Lake is an example an isolated kettle lake. These lakes are totally isolated with no water flowing out and generally the only inflows are precipitation and surface run-off. The lakes often have very small watersheds or

catchments that may be just several times the size of the lake. Only twelve of the Moraine's 32 lakes fall into this isolated kettle lake type. Of these, only five are over 10 hectares in size. In addition to Bond, these larger ones include Philips, Preston, Musselman and Gibson lakes.

In a comparison of these lakes, Bond is the only example of a coldwater isolated kettle lake, while Philips and Gibson lakes are the best examples of warmwater isolated kettle lakes. All three lakes are nutrient poor or oligotrophic lakes noted for their exceptional water quality and water clarity. This is probably due to their largely forested watersheds and the lack of surrounding development. In contrast, Musselman Lake and Preston Lake, two other isolated kettles, are compromised by the presence of housing developments along their shores.

This ANSI fulfills the following five criteria for life science ANSI selection:

Representation

The ANSI provides excellent representation of Oak Ridges Moraine natural features, including a closed kettle bog and coldwater kettle lake, with a good representation of mature mixed/conifer forests and deciduous forests on the surrounding slopes.

Diversity

The ANSI is noteworthy for its diversity of 352 vascular plant species, 47 breeding bird species, 9 reptiles and amphibians, 8 fish species and 21 vegetation communities. A remarkably high diversity considering the ANSI is only 40 ha in size.

Special Features

Bond Lake & Bog has a high number of 54 significant plant species and 23 significant animal species. Most noteworthy is the locally rare open water aquatic flora and the kettle bog flora, with such regionally rare bog species as Few-flowered Sedge and Rough Cotton-grass.

Kettle bogs or kettle peatlands are a provincially rare community type. They occupy less than 0.02 percent of the Moraine, and bogs and fens are known to cover less than 0.01 percent of southern Ontario (Riley 1989b). On the Oak Ridges Moraine there are 33 kettle bogs covering a total of only 45 hectares (OMNR 2001).

Kettle lakes such as Bond are considered a rare ecosystem in southern Ontario and site district 6E7. On the Moraine there are only 32 kettle lakes covering about 307 ha, less than 0.2% of the Moraine's surface (OMNR 2001). Only a few of these kettle lakes, such as Bond, are considered coldwater lakes.

Condition

Because most of the surrounding kettle is forested with little development, Bond Lake is exceptional in its water quality and clarity. There are only a few docks on its western shore associated with three residences. Motorboating in the lake has, however, resulted in some shore erosion.

Its surrounding forests show little disturbance and are noteworthy for their large number of mature trees that are in excess of a hundred years old. Several Red Oak trees reach up to a meter in diameter at breast height. Young forests are confined to a few small stands in the northwest corner of the lake. The introduced European shrub Common Buckthorn occurs in the understorey of these young forests.

Ecological Function

Areas of open water are rare on the Oak Ridges Moraine and are essential for many animal and plant species. Bond Lake, with 17.8 ha of open water and 2.7 km of shoreline edge, is noteworthy for the Oak Ridges Moraine and site district 6E7. Its open waters are important as a migratory stopover for waterfowl, and its fish community, turtles and amphibians are diverse and healthy.

Bond Lake & Bog is part of a network of connected natural areas in an agricultural setting. Woodland frog populations probably move through agricultural lands between Bond Lake and Jefferson Forest to the ANSI's kettle bog and to wetlands further north. Resident Leopard Frogs and American Toads would forage in the surrounding agricultural lands and the lake's resident turtles would also nest in the fields. Leopard Frogs from surrounding wetlands probably use the bottom sediments of Bond Lake as a winter hibernating site.

Recommendations

The scenic Bond Lake & Bog ANSI provides excellent representation of an Oak Ridges Moraine closed kettle bog and coldwater kettle lake. The ANSI is also noteworthy for its good quality and mature forested slopes and its exceptional diversity of rare species.

Both the lake and bog kettles have surface catchment basins that together cover about 92 ha. Because of their small catchments with no surface outflows and their reliance on surface runoff, the kettles are extremely sensitive to development, water taking and nutrient inputs. The low nutrient status of the bog's peats makes it even more susceptible to nutrient inputs. Due to their high sensitivity and significance, development in the surface catchment basin of the lake and bog would have negative impacts on its ANSI values. Protection should also be afforded to the groundwater catchments of the lake and bog.

To ensure the protection of Bond Lake & Bog, reforestation and natural regeneration should be encouraged in the remainder of the surface catchment basin, particularly on the ridge dividing the bog and lake. To further reduce contaminants and to minimize shore erosion, consideration should be given to phasing out motorboating in Bond Lake.

Broad ecological corridors around Bond Lake & Bog need to be maintained and strengthened. Studies have shown the importance of corridors in maintaining diversity and resiliency in an ecosystem (Riley and Mohr 1994, OMNR 2000). This is especially the case for critical habitats such as kettle lakes. Connections include those between Bond Lake & Bog ANSI and the Catfish Pond natural area to the east and the large forested tract of the Jefferson Forest ANSI to the south. Further afield there are connections to the east with the Lake Wilcox Kettle Wetlands & Uplands ANSI and one to the west with the other wetlands that make up the Philips - Bond - Thompson Wetland Complex.

A corridor should also be strengthened to the north connecting the ANSI with two wetlands that provide critical breeding habitat for the ANSI's woodland frog populations. Currently, two narrow frog crossings through housing development and under a road exist between these wetlands and the ANSI. The crossings do not appear to be working as evidenced by road kills and reduced woodland frog populations in the wetlands since the road and housing have been built.

Serious consideration should be given to the removal of invasive exotic plants in the ANSI. The area of greatest concern occurs on the northwestern corner of the ANSI where the European shrub Common Buckthorn has become frequent in a successional forest.

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Ontario

Bond Lake & Bog Area of Natural and Scientific Interest

NOTE

The information displayed on this map has been compiled from various sources. While every effort has been made to accurately depict the information, this map should be viewed as illustrative only.

For detailed information on the ANSI, the individual files held by the Aurora District Office or the Ministry of Natural Resources should be consulted.

Information Provided by the Ministry of Natural Resources,
Aurora District, Aurora, Ontario

Base information derived from the Ontario Base Map, 1983,
scale 1:10,000, Peterborough, Ontario

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Queen's Printer for Ontario
Printed in Ontario, Canada



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Scale 1:7,500 (Approx.)
70 0 70 140 M

Legend

- Area of Natural and Scientific Interest (ANSI)
- Woodland
- Regenerating Land
- Wetland
- Kettle Lake
- Intermittent Stream
- Cold Water Stream
- Urban Area
- Contour Line (5 metre interval)
- Road



**INVENTORY OF THE PHILIPS LAKE
AREA OF NATURAL AND SCIENTIFIC INTEREST**

*Ontario Ministry of Natural Resources
Aurora District
May 2001*

OBM Map: 10 17 6200 48600; **NTS Map:** 30M/14

UTM Reference: 623500 4864500

Latitude: 43° 55' 30" **Longitude:** 79° 26' 15"

Area: 20.6 ha

Aerial Photographs: 1:10,000 MNR, 1978, Roll 53, Line & No.: 4364: 92-94; 1:24,000 MNR, 10 May 1992, Roll 033, Line & No. 12: 26-27; 1:8,000 TRCA, 18 April 1993, Roll 015, Line & No. 396-398; 1:10,000 MNR, 1997 infrared, Roll 37, Line & No. 37: 6281-6282.

Municipality, Lots & Concessions: Regional Municipality of York, Town of Richmond Hill, King Geographic Township: Lots 60, 61, Conc. 1 WYS.

General Location: North of Jefferson Sideroad between Yonge and Bathurst Streets

Site District: 6E7

Ownership: private

Dates Investigated: 1996: Oct. 3; 1997: Sept. 18; 1999: April 15; 2000: March 25, April 10, May 17.

Investigators: MNR Steve Varga, Mark Heaton; TRCA: Lionel Normand

Compiler: Steve Varga

Introduction

Philips Lake occurs on the Oak Ridges Moraine in the northern portion of Richmond Hill. The Moraine is noteworthy for its extensive forests and diverse wetlands that range from headwater swamps to kettle bogs and kettle lakes. Its scenic hills stretch east for 160 km from the Niagara Escarpment through the heart of the Greater Toronto Area to terminate beyond Rice Lake.

This inventory is part of ongoing work to re-examine and update Areas of Natural and Scientific Interest (ANSIs) on the Oak Ridges Moraine (site district 6E7) (Lindsay 1984). As part of this re-examination, additional natural areas such as Philips Lake were inventoried for possible ANSI status. Focus was given to kettle lakes and kettle bogs, because they were under-represented in the original selection of ANSIs on the Moraine.

The fieldwork for Philips Lake was done in partnership with the Toronto and Region Conservation Authority. This inventory also incorporates the 1996, 1997 and 2000 floral and faunal work undertaken by Dan Gregory and David Cunningham (Michael Michalski Associates 1999a,b, 2000).

The Ministry has identified Philips Lake and its surrounding wetlands as part of the provincially significant Philips - Bond - Thompson Wetland Complex (OMNR 1998). Philips Lake is also identified as an Environmental Policy Area, a Wetland and part of a Regional Greenlands System in York Region's Official Plan (York Region 1994).

Physiography

The Oak Ridges Moraine is one of the province's largest moraines, rising up to 300 metres above the surrounding lake plains. The Moraine was created under and between the margins of two glacial ice sheets. Meltwaters deposited huge amounts of sands, silts and gravels in a large lake now occupied by the Moraine (Barnett et al 1998).

An east-west trending band across the central portion of the Moraine supports hundreds of small depressional wetlands or kettles. This band extends from the Town of Caledon East in northeastern Peel, to King Township, Richmond Hill and Whitchurch-Stouffville in York Region, to the hamlets of Goodwood and Glen Major in western Durham Region. These kettles were created during the last de-glaciation. Many of the depressions became open water ponds and lakes, with the smaller ones gradually filling in with plant debris and succeeding into marshes and thicket swamps. The largest and deepest depressions such as Philips, have remained kettle lakes. There are a total of 32 kettle lakes on the Moraine ranging in size from 2 ha to 49 ha. They represent one of the largest concentrations of kettle lakes in southern Ontario.

Philips Lake is one of only eleven lakes greater than 10 hectares in size on the Moraine. The entire kettle around Philips Lake covers 28 ha with the lake occupying 10.8 ha. It is entirely isolated with no water outflows. The only water to the lake is precipitation and surface runoff from the surrounding kettle slopes. There is probably also a shallow groundwater contribution to the lake from a perched aquifer in the Halton Till (Hunter pers. comm. 2001). The aquifer contribution would be primarily in the spring and mainly from the north and west sides of the lake.

Philips Lake has a broad, shallow margin that is less than 3 metres deep and varies from 20 to 130 metres wide. The central bowl of the lake is up to 27 metres deep. The shallow margin of the lake supports an extensive open water aquatic community and associated wetlands. Relatively oval in shape, the lake has five shallow bays. Four of these bays have peat deposits of over a metre deep supporting marshes, thicket swamps and a bog. Open water moats have developed along the lake edge of these bays, isolating the peat wetlands from the shoreline. The fifth bay, at the northern tip of the lake, sustains an open water community.

The upper kettle slopes around the lake are largely covered in forests and regenerating fields on calcareous Halton Till underlain by thick sand deposits. The ANSI's permeable morainal deposits are part of a significant recharge area for the Moraine's aquifers (Hunter and Assoc. with Raven Beck Environ. Ltd 1996).

Vegetation

The Philips Lake ANSI contains 12 vegetation community types that range from open water aquatics to mature Sugar Maple forests (Table 1).

The broad shallow margins of the lake and the high clarity of its waters sustain a rich and extensive open water aquatic community of floating and submergent plants. White Water-lily (*Nymphaea odorata*), the occasional Bullhead Pond-lily (*Nuphar variegata*) and Floating Pondweed (*Potamogeton natans*) dominate the floating aquatic beds nearer to shore. The submergent beds have a luxuriant growth of Tape-grass (*Vallisneria americana*) and Canada Waterweed (*Elodea canadensis*). Secondary species include Large-leaved Pondweed (*Potagometon amplifolius*), in deeper waters, Common Coontail (*Ceratophyllum demersum*) and, occasionally, Flat-stemmed Pondweed (*Potamogeton zosteriformis*) and Sago Pondweed (*Potamogeton pectinatus*).

Several sheltered embayments in the northern portion of the lake support a free-floating mat of Common Duckweed (*Lemna minor*), Columbian Water-meal (*Wolffia columbiana*) and Northern Water-meal (*Wolffia borealis*); below this lies submergent beds of Common Coontail.

The central-western and north-eastern bays of Philips Lake and two smaller bays sustain emergent marshes and thicket swamps. These wetlands occur on thick

peats with open water moats along the bay edge. There are scattered shrubs of Red-osier Dogwood (*Cornus stolonifera*), Pussy Willow (*Salix discolor*) with the occasional Leatherleaf (*Chamaedaphne calyculata*) and Narrow-leaved Meadowsweet (*Spiraea alba*). Most plentiful are stands of Common Cattail (*Typha latifolia*) with scattered Canada Blue-joint (*Calamagrostis canadensis*), Marsh Fern (*Thelypteris palustris*), Giant Burreed (*Sparganium eurycarpum*), Northern Water Horehound (*Lycopus uniflorus*) and, along the lake side of the bays, large colonies of Green Arrow Arum (*Peltandra virginica*).

Another Common Cattail marsh occurs in a 0.4 ha kettle just northeast of the lake. Associated with the cattails are Climbing Nightshade (*Solanum dulcamara*) and Bulblet-bearing Water-hemlock (*Cicuta bulbifera*).

A 0.2 ha bay in the southwestern corner of the lake supports a floating treed bog separated from shore by an open water moat. The bog is more appropriately called a kettle peatland because it has species typical of more acidic bogs mixed with those typical of more neutral fens. The kettle peatlands on the Moraine probably have more affinities with poor fens than true acid bogs.

Trees of Tamarack and the occasional trees and saplings of White Pine, White Birch and Red Maple cover 50% of the bog. Below, there are scattered tall shrubs of Pussy Willow, Red-osier Dogwood, Chokeberry (*Aronia prunifolia*) and Winterberry (*Ilex verticillata*). Covering the dense Sphagnum moss groundlayer is a low shrub layer of Leatherleaf. There are also isolated clumps of Bog Laurel (*Kalmia polifolia*), Large Cranberry (*Vaccinium macrocarpon*), Marsh Fern, Northern Water Horehound, Pitcher-plant (*Sarracenia purpurea*) and Hairy Sedge (*Carex lasiocarpa*).

Forests largely cover the flanking slopes of Philips Lake. Most frequent are fresh forests of Red Oak with scattered American Beech and Sugar Maple on the steeper slopes around the northern and eastern portions of the lake. Common in the understorey are shrubs of Chokecherry (*Prunus virginiana*), Round-leaved Dogwood (*Cornus ruosa*) and Witch-hazel (*Hamamelis virginiana*) and such herbs as False Solomon's-seal (*Smilacina racemosa*), Bracken Fern (*Pteridium aquilinum*), Blue-stem Goldenrod (*Solidago caesia*), Wild Sarsaparilla (*Aralia nudicaulis*) and Large-leaved Aster (*Aster macrophyllus*). In the northwest corner, there is a

mature, fresh broadleaf forest of Sugar Maple and American Beech with an understorey of Yellow-trout Lily (*Erythronium americanum*) and Chokecherry. A small stand on the northeastern side of the lake supports a successional forest of Large-toothed Aspen with scattered White Ash and White Elm and an understorey dominated by False Solomon's-seal. On the western slopes there are conifer plantations of Scots Pine, White Cedar, European Larch and White Pine with the occasional Norway Spruce, White Spruce and Red Pine. The remaining slopes support regenerating fields. These fields also encircle the small cattail marsh kettle just northeast of the lake.

Table 1. Vegetation community types

Wetland Community Types (12.1 ha)

1. Deep Open Water (unvegetated) (5.7 ha)
2. Open Water Aquatics
 - a. Tape-grass - Canada Waterweed – White Water-lily – Bullhead Pond-lily - Common Coontail – Large-leaved Pondweed (4.7 ha)
 - b. Common Duckweed – Common Coontail (0.4 ha)
3. Organic Marsh: Common Cattail (0.9 ha)
4. Organic Thicket Swamp:
 Common Cattail – Red-osier Dogwood – Pussy Willow (0.2 ha)

5. Treed Kettle Bog:

Tamarack – White Pine – Leatherleaf (0.2 ha)

Terrestrial Community Types (4.2 ha)

6. Fresh Deciduous Forest:
 Sugar Maple – Beech (0.3 ha)
7. Fresh Deciduous Forest:
 Red Oak – Beech (3.8 ha)
8. Successional Deciduous Forest:
 Large-toothed Aspen (0.1 ha)

Cultural Community Types (4.3 ha)

9. Conifer Plantation (2.5 ha)
 - a. Scots Pine
 - b. European Larch
 - c. White Pine
 - d. White Cedar
10. Regenerating Field (1.6 ha)

Flora

Philips Lake supports 260 vascular plant species, with a high concentration of 34 significant species (Table 2). There are hundreds of plants of the provincially rare Green Arrow Arum lining the lakeside edge of the cattail marshes. This is the only colony for this arum in the entire Greater Toronto Area and the only known colony on the Oak Ridges Moraine (site district 6E7). Another 33 species are rare in the Ontario Ministry of Natural Resources' site district 6E7, an area covering the Oak Ridges Moraine as well as the adjacent South Slope and a portion of the Niagara Escarpment (Varga et al. 2001). Six of these significant species: Downy Arrow-wood (*Viburnum rafinesquianum*), Yellow Lady's Slipper (*Cypripedium calceolus*), Pringle's

Hawthorn (*Crataegus pringlei*), Oval-leaf Sedge (*Carex cephalophora*), Witch-hazel (*Hamamelis virginiana*) and Canada Soapberry (*Shepherdia canadensis*) are found in the Red Oak forests. The other 27 significant species occur in the lake's open water aquatic community, its marshes and its bog. Species largely restricted to the bog and occasionally in the organic marshes include Leatherleaf, Rattlesnake Manna Grass (*Glyceria canadensis*), Marsh Cinquefoil (*Potentilla palustris*), Bog Laurel, Bog Buckbean (*Menyanthes trifoliata*), Hoary Willow (*Salix candida*), Round-leaved Sundew (*Drosera rotundifolia*), Hairy Sedge, Large Bog Cranberry, Pitcher-plant, Bog Willow (*Salix pedicellaris*) and Chokeberry. The Tape-grass aquatic beds are the largest and best stands of this locally rare species and community type on the Moraine. Other rare species in the open water aquatic community include Large-leaved Pondweed, Common Coontail, Flat-stemmed Pondweed, Variable-leaved Pondweed, Water-marigold (*Megalodonta beckii*), White Water-lily, Bullhead Pond-lily, Canada Waterweed, Northern Water-meal and Columbian Water-meal.

Table 2. Significant vascular plants

Status: P – Provincially rare (Oldham 1999); R - Regionally rare (former OMNR Central Region, based on Riley (1989a)); L - Locally rare in OMNR site district 6E7 (based on Varga et al 2001); * - Species also rare in the Regional Municipality of York. Source & date: SV - Steve Varga (1996, 1997, 2000) and DG – Dan Gregory (1996, 1997); Voucher: TRT - Royal Ontario Museum vascular plant herbarium, TRTE – University of Toronto Erindale College vascular plant herbarium, SR - Sight record.

PRL*	Species	Source & Date
	<i>Peltandra virginica</i> Green Arrow Arum	DG TRTE1996, SV TRT1996
L*	<i>Aronia melanocarpa</i> Chokeberry	SV TRT96, DG TRTE96
L*	<i>Carex cephalophora</i> Oval-leaf Sedge	SV SR2000
L*	<i>Carex lasiocarpa</i> Hairy Sedge	SV SR1996, DG TRTE1996
L	<i>Ceratophyllum demersum</i> Common Coontail	SV SR1996
L*	<i>Chamaedaphne calyculata</i> Leatherleaf	SV TRT96, DG SR96
L*	<i>Crataegus pringlei</i> Pringle's Hawthorn	SV SR2000
L	<i>Cypripedium calceolus</i> Yellow Lady's Slipper	SV SR2000
L*	<i>Dulichium arundinaceum</i> Three-way Sedge	DG SR1996
L*	<i>Drosera rotundifolia</i> Round-leaved Sundew	DG TRTE1996
L	<i>Eloea canadensis</i> Canada Waterweed	SV TRT1996
L*	<i>Glyceria canadensis</i> Rattlesanke Manna Grass	DG TRTE1996
L	<i>Hamamelis virginiana</i> Witch-hazel	SV TRT1996

L*	<i>Kalmia polifolia</i>	SV TRT1996
	Bog Laurel	
L*	<i>Megalodonta beckii</i>	SVTRT1996
	Water-marigold	
L*	<i>Menyanthes trifoliata</i>	DG SR1996
	Bog Buckbean	
L	<i>Nuphar variegata</i>	SV TRT1996, DG SR1996
	Bullhead Pond-lily	
L	<i>Nymphaea odorata</i>	SV TRT1996, DG SR1996
	White Water-lily	
L*	<i>Polygonum hydropiperoides</i>	SV TRT1996
	Mild Water-pepper	
L*	<i>Potamogeton amplifolius</i>	SV TRT1996, DG SR1996
	Large-leaved Pondweed	
L*	<i>Potamogeton gramineus</i>	SV TRT1996
	Variable-leaved Pondweed	
L*	<i>Potamogeton zosteriformis</i>	SV TRT96, DG TRTE96
	Flat-stemmed Pondweed	
L	<i>Potentilla palustris</i>	SV SR1996
	Marsh Cinquefoil	
L*	<i>Salix candida</i>	DG SR1996
	Hoary Willow	
L*	<i>Salix pedicellaris</i>	SV TRT1996, DG SR1996
	Bog Willow	
L*	<i>Sarracenia purpurea</i>	SV TRT 1996, DG SR1996
	Pitcher-plant	
L*	<i>Sheperdia canadensis</i>	DG SR1996
	Canada Soapberry	
L	<i>Sparganium eurycarpum</i>	DG SR1996
	Giant Bur-reed	
L*	<i>Spiranthes romanzoffiana</i>	DG SR1996
	Hooded Ladies'-tresses	
L*	<i>Vaccinium macrocarpon</i>	SV TRT1996, DG SR96
	Large Bog Cranberry	
L*	<i>Vallisneria americana</i>	SV TRT1996, DG SR1996
	Tape-grass	
L*	<i>Viburnum rafinesquianum</i>	DG SR1996
	Downy Arrow-wood	
L*	<i>Wolffia borealis</i>	SV SR1997, DG SR1996
	Northern Water-meal	
L*	<i>Wolffia columbiana</i>	SV SR1997, DG SR1996
	Columbian Water-meal	

Fauna

Philips Lake sustains 35 breeding bird species, with 8 of them considered significant species (Table 3). Seven are conservation priority bird species for forest, wetland and open country habitats in southern Ontario based on Bird Studies Canada (Couturier 1999). Eastern Wood-peewee is a species of concern in the Toronto and Region Conservation Authority watershed (TRCA 2001). They include rare species as well as species that are forest or field area-sensitive species and those indicative of good quality undisturbed wetlands. Many of these sensitive species have low numbers or are absent from urbanized portions of the TRCA watershed.

Despite its small size, the forests around the lake support a few forest interior and forest edge bird

species such as Eastern Wood-peewee and Red-eyed Vireo. Their presence may be due to the proximity of a large forested block to the east in the Jefferson Forest ANSI.

Bobolink a bird of field habitats is also a species of concern. The Lake's Wood Duck pair is a conservation priority species that nests in tree hollows around the lake. Two other waterfowl species, Mallard and Canada Goose also nest around the lake.

Eight amphibian and reptile species are known from Philips Lake, including American Toad, Northern Spring Peeper, Green Frog, Wood Frog, Northern Leopard Frog, Northern Redback Salamander, Common Snapping Turtle and Midland Painted Turtle. Most noteworthy are the large breeding populations of Spring Peepers and Wood Frogs. They breed in the backwater moats of the cattail marshes at Philips Lake. The largest populations, however, occur in the cattail marsh kettle just northeast of the lake. These woodland frogs require seasonally flooded wetlands in the spring for breeding and nearby forested habitats for feeding and hibernating. Some of the woodland frog populations reside in the ANSI's forests while others probably reside in a woodlot to the south, across Jefferson Sideroad. This is supported by the large spring movements of Wood Frogs northwards from the woodlot, crossing the road and heading to the Philips Lake ANSI for breeding. In the TRCA watershed, these woodland frogs are considered species of concern because they are largely or entirely absent from urbanized areas (Table 3). This is attributable to the loss of wetland habitat, the loss of adjacent forests and their connecting links.

Other wetland species reliant on adjacent upland habitats include the resident Midland Painted Turtle, Common Snapping Turtle, American Toad and Northern Leopard Frog. The turtles lay their eggs in the surrounding fields. The Leopard Frogs and Toads rely on the surrounding fields and agricultural lands for foraging, with the Toad also feeding in woodlands. Some of the Toads like the Wood Frog also travel north in the spring from the woodlot and fields by Jefferson Sideroad to Philips Lake for breeding. The resident Mallards nest in fields often a considerable distance from the lake.

Philips Lake supports a healthy population of six species of fish including Yellow Perch, Pumpkinseed, Largemouth Bass, Smallmouth Bass, Brown Bullhead and Golden Shiner. These species are typically found in

cool and warm water lakes. The temperature and oxygen profile of Philips Lake during the late summer months restricts the available habitat for fish to depths less than 7 metres. Given the lack of large groundwater upwellings and permanent surface flow, this lake is not capable of supporting coldwater species such as Brook Trout. However, the broad shallow, zone around the perimeter of the lake is very productive for warmwater fish such as Largemouth Bass. The lake is therefore classified as warmwater.

Incidental observations on mammals include Eastern Chipmunk, Eastern Cottontail, Woodchuck, Meadow Vole, Gray Squirrel, Red Squirrel, Raccoon and White-tailed Deer (TRCA 1997, Michael Michalski 1999a,b, 2001).

Table 3. Significant fauna

Status: s - species of concern in the TRCA watershed (TRCA 2001); p1 – conservation priority forest, wetland and open country bird species ranging from conservation priority level 1 (highest) to level 4 (lowest), based on Bird Studies Canada (Couturier 1999). Breeding bird status: o – Possible breeder, x – bird observed in suitable habitat during the breeding season; Source: SV – S. Varga 1997, 1999, 2000 fieldwork; LN - Lionel Normand 1997 fieldwork (TRCA 1997), DG - Dan Gregory 1997 fieldwork and DC - David Cunningham 2000 fieldwork (Michael Michalaski 1999a,b, 2000).

Breeding Birds

p4	Wood Duck	P	LN 1997
p4	Spotted Sandpiper	o	LN 1997
p4	Black-capped Chickadee	P	LN 1997
s	Eastern Wood-peewee	P	LN 1997
p4	Gray Catbird	x	DG 1997
p3	Eastern Kingbird	P	LN 1997
s p2	Bobolink	x	DG 1997
p3	American Goldfinch	x	LN 1997
Amphibians			
s	Northern Spring Peeper	SV,DC 2000, 1999, LN	1997
s	Wood Frog	SV,DC 2000, 1999, LN	1997

Conclusions

This inventory and a comparative study of other kettle lakes provides the basis for identifying Philips Lake as a provincial Area of Natural and Scientific Interest. It is the best example on the Oak Ridges Moraine of a warmwater isolated kettle lake noteworthy for its concentration of rare flora, its high quality open water aquatic communities, its organic marshes and its kettle bog. It supports two rare features inadequately represented in provincial ANSIs on the Oak Ridges Moraine: kettle lakes and kettle bogs.

Kettle lakes on the Oak Ridge Moraine can be divided into two major types: headwater kettle lakes and isolated kettle lakes. Headwater kettle lakes are situated in headwater areas, with a stream flowing from

them and streams or seeps often flowing into them. St. George, Mary, Hackett and Thompson (King Twp.) lakes are the best examples of this headwater kettle lake type.

Philips Lake is an example of an isolated kettle lake. There is no water flowing out and the only inflows are surface run-off and precipitation. The lakes often have very small watersheds or catchments that may be only several times the size of the lake. Only twelve of the Moraine's 32 lakes fall into this isolated kettle lake type. Of these, only five are over 10 hectares in size. In addition to Philips, these larger ones include Bond, Preston, Musselman and Gibson lakes.

In a comparison of these lakes, Philips and Gibson are the best examples of an isolated warmwater kettle lake, while Bond is the only example of a coldwater isolated kettle lake. All three lakes are nutrient poor or oligotrophic lakes noted for their exceptional water quality and water clarity. This is probably due to their largely forested watersheds and the lack of development around them. In contrast, Musselman Lake and Preston Lake, two other isolated kettles, are compromised by housing developments along their shores, although Preston still has reasonable water quality and a good example of a shrub bog.

In a comparison of Gibson and Philips lakes, both are noted for their high quality open water aquatics and marshes. Unique to Philips is a treed bog, an extensive Tape-grass open water aquatic community and large colonies of the nationally and provincially rare Green Arrow Arum. This showy emergent plant occurs nowhere else on the Moraine.

Philips Lake supports one of only four examples on the Moraine of a kettle bog fringing a lake. There is a shrub bog in a bay of Preston Lake which differs from the treed bog in Philips Lake. Two treed bogs also fringe much smaller kettle lakes, including the 3 ha Vandorf Lake in Vandorf ANSI and the 2.8 ha Swan Lake in the Wilcox Lake Kettle Wetlands & Uplands ANSI.

Kettle bogs are recognised as a provincially rare community type (Bakowsky 1996). Kettle bogs are more appropriately called kettle peatlands because they occur on thick organic deposits that have floristic affinities with both northern acid bogs and more neutral fens. The Moraine's kettle peatlands have closest affinities to poor fens. This is probably due to the

calcareous soils on the Moraine in contrast to the generally acidic substrates of northern Ontario.

This ANSI fulfils the following five criteria for life science ANSI selection:

Representation

The ANSI provides excellent representation of an Oak Ridges Moraine warmwater isolated kettle lake, one of only five such larger kettle lakes on the Moraine. It has the Moraine's best representation of Tape-grass open aquatic communities and high quality examples of organic cattail marshes and a lakeshore kettle bog, one of only four such bogs on the Moraine.

Diversity

The ANSI is noteworthy for its diversity of 260 vascular plant species, 35 breeding bird species, 8 amphibian and reptile species, 6 fish species and 12 vegetation communities that range from open water to Red Oak forests. A remarkably high diversity considering the ANSI is only 20 ha in size.

Special Features

It has a high concentration of 32 significant plant species and 10 significant bird and amphibian species. Most noteworthy is the nationally and provincially rare Green Arrow Arum and the locally rare kettle bog flora.

Kettle bogs or kettle peatlands are a provincially rare community type. They occupy less than 0.02 percent of the Moraine, and bogs and fens are known to cover less than 0.01 percent of southern Ontario (Riley 1989). On the Oak Ridges Moraine there are 33 kettle bogs covering a total of only 45 hectares (OMNR 2001), with only four bogs occurring on the fringes of kettle lakes.

Kettle lakes such as Philips are considered a rare ecosystem in southern Ontario and site district 6E7. On the Moraine there are only 32 kettle lakes covering about 307 ha, less than 0.2% of the Moraine's surface (OMNR 2001).

Condition

Philips Lake is exceptional in its water quality and clarity and its general lack of disturbance. Its water quality is probably attributable to its largely forested surrounding slopes. The only development is a boathouse and two docks on its eastern shores and an old carriageway that encircles the lake.

The forests on the north side of lake support mature Red Oak, Beech and Sugar Maple trees with a number of trees over 100 years in age. The conifer plantations on the west side of the lake help protect its surface catchment basin and provides a nursery site for native tree regeneration.

Ecological Function

Areas of open water are rare on the Oak Ridges Moraine and are essential for many animal and plant species. Philips Lake, with 10.8 ha of open water and 2 km of shoreline edge, is noteworthy for the Oak Ridges Moraine and site district 6E7. Its open waters are important as a migratory stopover for waterfowl and its fish, turtles and amphibians are diverse and healthy.

Areas of open water and its interface with terrestrial and wetland habitat are considered important to the diversity of animal and plant species. The lake is noteworthy for its species diversity and its high interspersion of wetland communities. One hectare of Philips Lake can vary from treed kettle bog to sheltered open water moat, to cattail marsh/thicket swamp to rich open water aquatic floating and submergent beds.

Philips Lake is a natural area occurring in an agricultural setting. Woodland frog populations probably move through agricultural lands between Philips Lake and kettle wetlands to the north, west and east and to a woodlot to the south. Resident Leopard Frogs and Toads forage in the surrounding agricultural lands and the lake's resident turtles also nest in the fields. Leopard Frogs from surrounding wetlands probably utilize the lake as a winter hibernating site.

Recommendations

The scenic Philips Lake ANSI provides excellent representation of an Oak Ridges Moraine coolwater isolated kettle lake. Its associated wetlands support a high concentration of rare plant species including a rare kettle bog and a Tape-grass open water aquatic community.

The entire surface catchment basin of the Philips Lake kettle covers only 28 ha. Because of its small catchment with no surface outflows, its reliance on surface runoff and its present high quality, Philips Lake is extremely sensitive to development, water taking and nutrient inputs. The low nutrient status of the lake's bog makes it even more susceptible to nutrient inputs. Due to its high sensitivity and significance, development in the surface catchment basin of Philips Lake would impact on ANSI values. Protection should

also be afforded to the groundwater catchment of the lake.

To further ensure the protection of Philips Lake, reforestation and natural regeneration should be encouraged in the remainder of the lake's catchment basin. The plantations on the west side of the lake should be managed through selective tree removal to promote native forest regeneration and a native understorey. This would reduce soil loss from the formerly bare understoreys of the plantations. To further reduce contaminants, consideration should be given to phasing out any motorboating.

Broad ecological corridors around Philips Lake need to be maintained and strengthened. Studies have shown the importance of corridors in maintaining diversity and resiliency in an ecosystem (Riley and Mohr 1994, OMNR 2000). This is especially the case for critical habitats such as kettle lakes. Connections around Philips Lake include those to the kettle wetlands to the north, west and east that are part of the Philips-Bond - Thompson Lake Wetland Complex. Another connection extends south of Jefferson Sideroad to a woodlot and dry valley that are part of the Rouge River watershed. Road surveys during the spring of 2001 show American Toad and Wood Frog movements between the woodlot and Philips Lake. Further afield there are connections to the east with Bond Lake & Bog ANSI and the large forested tract of Jefferson Forest and Lake Wilcox Kettle Wetlands & Uplands ANSIs.

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Philips Lake Area of Natural and Scientific Interest



Ontario

NOTE

The information displayed on this map has been compiled from various sources. While every effort has been made to accurately depict the information, this map should be viewed as illustrative only.

For detailed information on the ANSI, the individual files held by the Aurora District Office of the Ministry of Natural Resources should be consulted.

Information Provided by the Ministry of Natural Resources,

Aurora District, Aurora, Ontario.

Base information derived from the Ontario Base Map, 1983,
scale 1:10,000, Peterborough, Ontario

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Printed in Ontario, Canada



Scale 1:7,500 (Approx.)



Area of Natural and Scientific
Interest (ANSI)

Woodland

Regenerating Area

Wetland

Kettle Bog

Kettle Lake

Urban Area

Road

Contour Line
(5 metre interval)

Intermittent Stream

Cold Water Stream



INVENTORY OF THE LAKE ST. GEORGE AREA OF NATURAL AND SCIENTIFIC INTEREST

***Ontario Ministry of Natural Resources
Aurora District
May 2001***

OBM Map: 10 17 6250 48650; **NTS Map:** 30M/14

UTM Reference: 626000 4868000

Latitude: 43° 57' 25" **Longitude:** 79° 25' 30"

Area: 71.8 ha

Aerial Photographs: 1:10,000 MNR, 1978, Roll 48, Line & No.: 4367: 105-106; 1:24,000 MNR, 10 May 1992, Roll 33, Line & No. 12: 28-30; 1:8,000 TRCA, 18 April 1993, Roll 016, Line & No. 31: 125-127; 1:10,000 MNR, 1997 infrared, Roll 38, No. 6682-6684, 6847-6849.

Municipality, Lots & Concessions: Regional Municipality of York, Town of Richmond Hill, Whitchurch Geographic Township: Lots 6-9, Conc. 2.

General Location: North-central portion of the Town of Richmond Hill, north of Bethesda Sideroad and east of Bayview Avenue

Site District: 6E7.

Ownership: Toronto and Region Conservation Authority, education centre, entry by permission only

Dates Investigated: 1996: July 18, 22, Sept. 17, Oct. 23; 1997: April 23, August 8; 2000: May 9.

Investigators: MNR Steve Varga, Adriana Stagni and Kari Van Allen; TRCA: David Green and Lionel Normand.

Compiler: Steve Varga

Introduction

Lake St. George occurs on the Oak Ridges Moraine in the northern portion of Richmond Hill. The Moraine is noteworthy for its extensive forests and diverse wetlands that range from headwater swamps to kettle bogs and kettle lakes. Its scenic hills stretch east for 160 km from the Niagara Escarpment through the heart of the Greater Toronto Area to terminate beyond Rice Lake.

This inventory is part of an ongoing effort to re-examine and update Areas of Natural and Scientific Interest (ANSIs) on the Oak Ridges Moraine (site district 6E7) (Lindsay 1984). As part of this re-examination, additional natural areas such as Lake St. George were inventoried for possible ANSI status. Focus was given to kettle lakes and kettle bogs because they were under-represented in the original selection of ANSIs on the Moraine.

The fieldwork for Lake St. George was done in partnership with the owners of the lands, the Toronto and Region Conservation Authority. It also incorporates the fieldwork of Gore and Storrie (1993) and Fennerty & Collishaw (1978).

The Ministry has identified Lake St. George and its surrounding wetlands as part of the provincially significant Wilcox – St. George Wetland Complex (OMNR 1998). Lake St. George is also identified as an Environmental Policy Area, a Wetland and part of a Regional Greenlands System in York Region's Official Plan (York Region 1994).

Physiography

The Oak Ridges Moraine is one of the province's largest moraines, rising up to 300 metres above the surrounding lake plains. The Moraine was created under and between the margins of two glacial ice sheets. Meltwaters deposited huge amounts of sands, silts and gravels in a large lake now occupied by the Moraine (Barnett et al 1998).

An east-west trending band across the central portion of the Moraine supports hundreds of small depressional wetlands or kettles. This band extends from the Town of Caledon East in northeastern Peel, to King Township, Richmond Hill and Whitchurch-Stouffville in York Region, to the hamlets of Goodwood and Glen Major in western Durham Region. These kettles were created during the last de-glaciation. Many of the depressions became open water ponds and lakes, with the smaller ones gradually filling in and succeeding into marshes and thicket swamps.

The largest and deepest depressions such as St. George, have remained kettle lakes. There are a total of 32 kettle lakes on the Moraine ranging in size from 2 ha to 49 ha. They represent one of the largest concentrations of kettle lakes in southern Ontario. Lake St. George at 10.4 ha is one of only eleven lakes 10 ha or greater in size on the Moraine.

Lake St. George has a dumb-bell shape. The two bowls are 15 to 16 metres deep with a shallow margin of under 3 metres deep extending for 25 to 35 metres from shore. The narrow neck between the two bowls is under 3 metres deep. Marshes and swamps occur around the lake, particularly between the two bowls of the lake on its south side. Seepage zones are evident in many of the marshes and swamps. Stands of dead White Cedar trees around the edge of the lake are evidence of a period of higher water levels caused by a

beaver dam which once partially blocked the outlet of the lake.

The kettle around Lake St. George is situated in the midst of a broad trough along the East Humber River that is surrounded by morainal ridges. In the trough, groundwater is often close to the surface, resulting in an abundance of wetlands. The kettle slopes around the lake are very gradual, covering about 163 hectares of the Humber trough and extending up to the edges of the morainal ridges. The kettle slopes rise 22 metres on the southeast side and 13 metres on the northeast side. To the west, the Lake St. George kettle slopes down towards the largest kettle lake on the Moraine, Lake Wilcox. A 400 metre long stream, a headwater for the East Humber River, flows from St. George into Lake Wilcox. Lake St. George is in turn fed by two intermittent streams, which originate from swamps to the north.

The kettle slopes around St. George are largely covered in swamps and young regenerating forests, thickets and fields on sandy deposits. These permeable sands are part of a significant recharge area for the Moraine's aquifers (Hunter and Assoc. with Raven Beck Environ. Ltd 1996).

Vegetation

Lake St. George supports 44 vegetation community types that range from open water aquatics to White Cedar conifer forests (Table 1).

The shallow margins of the lake sustain a rich, open water aquatic community. In waters up to 3 metres deep there are submergent beds dominated by Starwort (*Chara* sp.) and such secondary species as Knotty Pondweed (*Potamogeton nodosus*), Slender Naiad (*Najas flexilis*), Common Coontail (*Ceratophyllum demersum*) and Common Bladderwort (*Utricularia vulgaris*). Closer to shore there are floating beds of White Water-lily (*Nymphaea odorata*) and Bullhead Pond-lily (*Nuphar variegata*) and emergent beds of Hard-stemmed Bulrush (*Scirpus acutus*). Along the shore edge there is a low shrub layer of Water-willow (*Decodon verticillatus*) mixed with Hard-stemmed Bulrush.

Behind these lakeshore communities there are seepage-fed marshes and swamps on organic soils. Most of the marshes were formerly White Cedar swamps before beavers, which had temporarily blocked the outlet from the lake, flooded them. Standing dead White Cedar trees and such grasses and sedges as Tussock Sedge (*Carx stricta*), Canada Blue-joint (*Calamagrostis canadensis*) and Rice Cut Grass (*Leersia oryzoides*)

dominate most of the marshes around the lake. Scattered saplings of White Cedar and shrub patches of Red-osier Dogwood suggest these marshes are gradually succeeding back to swamps as water levels have returned to normal. Along the fringes, there are occasional remnants of White Cedar conifer swamps and White Cedar – White Elm mixed swamps that survived the beaver flooding. Sensitive Fern (*Onoclea sensibilis*), Dwarf Raspberry (*Rubus pubescens*) and Fowl Manna Grass (*Glyceria striata*) dominate their understoreys.

A broad organic marsh and a remnant White Cedar swamp flank a low ridge on the south side of the lake, between its two waterbodies. This wetland approaches fen conditions. Inland Sedge (*Carex interior*), Fowl Manna Grass and Tussock Sedge dominate along with such fen species as Wild Timothy (*Muhlenbergia glomerata*), Yellow Sedge (*Carex flava*) and Little Yellow Sedge (*Carex cryptolepis*). There are also standing dead White Cedar and Tamarack trees, scattered saplings of White Cedar and shrubs of Red-osier Dogwood.

In the northeast corner of the lake, there is an organic marsh dominated by Common Cattail (*Typha latifolia*) with Water Horsetail (*Equisetum fluviatile*), a secondary species. There are also scattered shrub patches of Red-osier Dogwood and Narrow-leaved Meadowweet (*Spiraea alba*) with Common Cattail, Sensitive Fern (*Onoclea sensibilis*) and Cyperus-like Sedge (*Carex pseudo-cyperus*) common in the understorey.

In the southeastern corner of the lake, there is a tongue of Silver Maple organic swamp. To the northwest, along an intermittent stream flowing into St. George there is a tongue of Hybrid Crack Willow (*Salix Xrubens*) mineral swamp and a marsh/thicket swamp of Red-osier Dogwood and Awned Sedge (*Carex atherodes*).

South of the lake, there are nine small kettle wetlands that support a wide variety of mineral wetlands. There are Silver Maple and Hybrid Crack Willow swamps, a Common Duckweed (*Lemna minor*) open pond and emergent marshes variously dominated by Woolly Sedge (*Carex pellita*), Lake Sedge (*Carex lacustris*), Soft-stemmed Bulrush (*Scirpus validus*), Water-parsnip (*Sium sauve*) and Green-fruited Bur-reed (*Sparganium emersum*). There are also thicket swamps of Missouri Willow (*Salix eriocephala*) and Slender Willow (*Salix petiolaris*).

To the north, two large wetlands supply intermittent water flows to Lake St. George. These wetlands occur on mineral substrates that are dominated by swamps of Hybrid Crack Willow, Green Ash and Balsam Poplar. There are also thicket swamps of Red-osier Dogwood and Slender Willow and marshes of Spotted Jewelweed and Common Cattail. Around these large wetlands, four small kettles support a marsh of Soft-stemmed Bulrush and Water-parsnip, Slender Willow thicket swamps and a Trembling Aspen and White Elm swamp.

Most of the uplands around the lake and its associated wetlands are former agricultural lands that are now dominated by younger conifer forests of White Cedar, and deciduous stands of Trembling Aspen and White Birch. Frequent in the understorey is the introduced shrub, Common Buckthorn (*Rhamnus cathartica*). As well, there are thickets of Staghorn Sumac and Common Buckthorn, regenerating fields and a few young conifer and deciduous plantations.

A small, older conifer forest of White Cedar with large White Pines occurs on slopes along the southeast side of Lake St. George. A few small Sugar Maple hedgerows also occur on the east side of the ANSI.

Table 1. Vegetation community types

Wetland Community Types

1. Open Water Aquatics
 - a. **Starwort** (*Chara* sp.) – Knotty Pondweed – Common Coontail - Slender Naiad – Common Bladderwort
 - b. Common Duckweed
2. Organic Marsh
 - a. **Hard-stemmed Bulrush** – Fragrant Water-lily – Bullhead Pond Lily – Starwort (*Chara* sp.)
 - b. **Water-willow** – Hard-stemmed Bulrush
 - c. **Tussock Sedge** – Canada Blue-joint – Rice Cut Grass
 - d. Inland Sedge – Fowl Manna Grass – Tussock Sedge
 - e. **Common Cattail** – Water Horsetail
3. Mineral Marsh
 - a. Lake Sedge
 - b. Soft-stemmed Bulrush – Lake Sedge
 - c. Woolly Sedge - Tussock Sedge
 - d. Common Cattail
 - e. **Spotted Jewelweed** – Common Cattail
 - f. Soft-stemmed Bulrush – Water-parsnip
 - g. Water parsnip – Green-fruited Bur-reed
 - h. Awned Sedge
4. Organic Thicket Swamp:

Narrow-leaved Meadowweet - Red-osier Dogwood – Common Cattail –Cyperus-like Sedge – Sensitive Fern
5. Mineral Thicket Swamp
 - a. Missouri Willow – Lake Sedge
 - b. Slender Willow
 - c. Red-osier Dogwood – Common Duckweed
 - d. Red-osier Dogwood – Awned Sedge
 - e. Red-osier Dogwood – Slender Willow – Common Duckweed

6. Organic Deciduous Swamp:
Silver Maple
7. Organic Mixed Swamp:
White Cedar – White Elm – Fowl Manna Grass – Sensitive Fern – Dwarf Raspberry
8. Organic Conifer Swamp:
White Cedar – Inland Sedge – Fowl Manna Grass
9. Mineral Deciduous Swamp
 - a. Silver Maple
 - b. Silver Maple – Hybrid Willow
 - c. **Hybrid Crack Willow** – Red-osier Dogwood
 - d. **Hybrid Crack Willow** – Trembling Aspen – Red-osier Dogwood
 - e. **Hybrid Crack Willow** – Green Ash – White Elm – Red-osier Dogwood
 - f. **Green Ash** – Red-osier Dogwood
 - g. Trembling Aspen – White Elm – Red-osier Dogwood
 - h. Balsam Poplar

Terrestrial Community Types

10. Moist-Fresh Deciduous Forest:
Sugar Maple
11. Moist-Fresh Conifer Forest
 - a. White Cedar
 - b. **White Cedar** – White Pine
12. Successional Deciduous Forest
 - a. Trembling Aspen – White Birch
 - b. White Birch

Cultural Community Types

13. Conifer Plantation
 - a. Red Pine
 - b. Norway Spruce
 - c. White Pine
14. Deciduous Plantation
 - a. Norway Maple
 - b. Horse Chestnut – Black Locust
15. Thicket
 - a. Staghorn Sumac
 - b. Common Buckthorn
16. Regenerating Field

Flora

Lake St. George supports 308 vascular plant species, with a high concentration of 23 significant flora (Table 2). Three species, Awned Sedge, Cuckoo-flower (*Cardamine pratensis*) and Small Yellow Sedge, are rare in the Ontario Ministry of Natural Resource's former Central Region, an area covering the Greater Toronto Area and Dufferin, Simcoe, Hamilton - Wentworth, Waterloo and Niagara regional municipalities (Riley 1989). Twenty species are rare in the Ontario Ministry of Natural Resources' site district 6E7, an area covering the Oak Ridges Moraine as well as the adjacent South Slope and a portion of the Niagara Escarpment (Varga et al. 2001).

One species, Common Juniper (*Juniperus communis*), occurs on regenerating fields. Another species, Yellow Lady's Slipper (*Cypripedium calceolus*), is found in White Cedar forests. The other 21 species occur in a wide variety of wetlands. The lake's open waters support such rare species as Hard-stemmed Bulrush, White Water-lily, Bullhead Pond-lily, Common

Coontail, Knotty Pondweed, Canada Waterweed (*Elodea canadensis*) and Water-willow. The surrounding sedge marshes sustain the rare Small Yellow Sedge, Loesel's Twayblade (*Liparis loeselii*), Cuckoo-flower, Marsh Cinquefoil (*Potentilla palustris*), Wild Timothy, Marsh Bellflower (*Campanula aparinoides*), Woolly Sedge, River Cyperus (*Cyperus bipartitus*), Richardson's Rush (*Juncus alpinoarticulatus*), Variegated Horsetail (*Equisetum variegatum*), Nodding Ladies'-tresses (*Spiranthes cernua*) and Awned Sedge. Two rare species, Yellow Water Buttercup (*Ranunculus flabellaris*) and Moonseed (*Menispermum canadense*) occur in small kettle wetlands that support swamps, thicket swamps and marshes.

Table 2. Significant vascular plants

Status: R - Regionally rare (former OMNR Central Region, based on Riley (1989)); L - Locally rare in OMNR site district 6E7, an area centred on the Oak Ridges Moraine (based on Varga et al 2001); * - Species also rare in the Regional Municipality of York. Source & date: SV - Steve Varga fieldwork in 1996, 1997 and 2000, DG - David Green sight record; Voucher: TRT - Royal Ontario Museum vascular plant herbarium, SR - Sight record.

RL*	<i>Carex atherodes</i>	SV SR TRT1996
	Awned Sedge	
RL*	<i>Cardamine pratensis</i>	SV TRT2000
	Cuckoo-flower	
RL*	<i>Carex cryptolepis</i>	SV TRT1996
	Small Yellow Sedge	
L	<i>Campanula aparinoides</i>	SV SR1996
	Marsh Bellflower	
L*	<i>Carex pellita</i>	SV SR1996
	Woolly Sedge	
L	<i>Ceratophyllum demersum</i>	DG SR2000
	Yellow Lady's Slipper	
L*	<i>Cyperus bipartitus</i>	SV TRT1996
	River Cyperus	
L	<i>Cypripedium calceolus</i>	DG SR2000
	Yellow Lady's Slipper	
L*	<i>Decodon verticillatus</i>	SV SR1996
	Water-willow	
L	<i>Elodea canadensis</i>	SV TRT1996
	Canada Waterweed	
L*	<i>Equisetum variegatum</i>	SV TRT1996
	Variegated Horsetail	
L*	<i>Juncus alpinoarticulatus</i>	SV TRT1996
	Richardson's Rush	
L*	<i>Juniperus communis</i>	SV TRT1996
	Common Juniper	
L	<i>Liparis loeselii</i>	SV TRT1996
	Loesel's Twayblade	
L*	<i>Menispermum canadense</i>	SV SR1996
	Moonseed	
L*	<i>Muhlenbergia glomerata</i>	SV SR1996
	Wild Timothy	
L	<i>Nuphar variegata</i>	SV SR1996
	Bullhead Pond-lily	
L	<i>Nymphaea odorata</i>	SV SR1996
	White Water-lily	
L*	<i>Potamogeton nodosus</i>	SV TRT1996
	Knotty Pondweed	
L	<i>Potentilla palustris</i>	SV TRT1996
	Marsh Cinquefoil	

L*	<i>Ranunculus flabellaris</i>	SV TRT1996
	Yellow Water Buttercup	
L*	<i>Scirpus acutus</i>	SV SR1996
	Hard-stemmed Bulrush	
L*	<i>Spiranthes cernua</i>	SV SR1996
	Nodding Ladies'-tresses	

Fauna

Lake St. George sustains 54 breeding bird species (Gore and Storrie 1993, TRCA 1978, David Green and Lionel Normand 2000), with 23 of them significant species (Table 3). All of the significant species are considered conservation priority bird species for forest, wetland and open country habitats in southern Ontario, based on Bird Studies Canada (Couturier 1999). The Toronto and Region Conservation Authority also consider 16 of them species of concern in their watershed (TRCA 2001). They include rare species as well as species that are forest or field area-sensitive species and those indicative of good quality undisturbed wetlands. Many of these sensitive species have low numbers or are absent from urbanized portions of the TRCA watershed.

Twelve of the significant bird species are considered sensitive forest birds because they have the highest sensitivity to forest cover in southern Ontario (Cadman 1999, Couturier 1999, Burke & Nol 2000). These include Ruffed Grouse, Scarlet Tanager, White-throated Sparrow, Alder Flycatcher, Black-and-White Warbler, American Redstart, Northern Waterthrush, Sharp-shinned Hawk, Brown Creeper, Veery and Nashville Warbler. The latter four forest bird species are also rare or uncommon in the TRCA watershed, occurring at less than 20 stations (pers. comm. Lionel Normand 1999) (Table 3). Burke & Nol (2000) note that viable populations of Wood Thrush need about 500 hectares of woodlands

The fragmentation and loss of woodlands in the southern portion of the province and elsewhere in eastern North America has resulted in marked declines in forest interior habitat and in the number and diversity of many forest bird species (Riley and Mohr 1994). Cadman 1999 has shown that in southern Ontario the number of forest bird species declines steadily below 35.5% forest cover. In addition, urban development has also been shown to impact negatively on forest bird species. A recent study has shown that the number of forest bird species declined when urban development occurred within 100 metres of woodlots (Friesen et al 1995). This decline may be attributable to increased nest predation by elevated populations of racoons, skunks and squirrels associated with urban areas and to predation by domestic cats and dogs.

The Lake's Northern Waterthrush and Pied-billed Grebe and Virginia Rail in a marsh just south of the lake, are species of concern in the TRCA watershed. Other wetland species such as Green Heron, Alder Flycatcher and swamp Sparrow are also conservation priority species.

Field birds such as Eastern Meadowlark, Bobolink and Savannah Sparrow are conservation priority species. A number of them are experiencing declines and are area-sensitive birds preferring larger open country habitats.

Twelve amphibian and reptile species were found at Lake St. George, including American Toad, Northern Spring Peeper, Western Chorus Frog, Green Frog, Wood Frog, Northern Leopard Frog, Bull Frog, Snapping Turtle, Midland Painted Turtle, Northern Redbelly Snake, Brown Snake, Eastern Garter Snake and Bullfrog (pers. comm Natalie Helferty 2000; pers. comm. David Green 2000). Found in Lake St. George, Bullfrog is considered locally rare and a species of concern in the TRCA watershed (pers. comm. Lionel Normand 1999, TRCA 2001). Also noteworthy are the large breeding populations of Spring Peeper, Chorus Frog and Wood Frog. These woodland frogs breed in the spring in the seasonally flooded kettle wetlands around Lake St. George and for the rest of the year forage and hibernate in nearby forested habitat, with Chorus Frog also foraging in fields. These three frog species are considered species of concern because they are largely or entirely absent from urbanized areas of the TRCA watershed (TRCA 1999, Table 3). This is attributable to the loss of wetland habitat, the loss of adjacent forests and their connecting links.

Other wetland species such as Midland Painted Turtle and Common Snapping Turtle are also reliant on surrounding uplands. Although resident in the lake, these turtles lay their eggs in the surrounding fields. The Leopard Frogs and American Toads of St. George rely on the surrounding fields and agricultural lands for foraging, with the toads also in forests.

The Northern Redbelly Snake is species of concern in the TRCA watershed and is also locally rare. This snake migrates seasonally, feeding in forests and also in adjacent fields and agricultural lands.

Lake St. George supports a large diverse fish population of Northern Pike, Brown Bullhead, Rock Bass, Central Mudminnow, Bluntnose Minnow, Common Shiner, Golden Shiner, Banded Killifish, Iowa Darter, Yellow Perch, Pumpkinseed, Bluegill, Largemouth Bass, White Sucker and stocked Walleye. These species are indicative of a coolwater fishery,

intermediate between warmwater and coldwater. St. George, like all kettle lakes, has periods with low dissolved oxygen in its deeper waters during the late summer and late winter, before the lake turns over in spring and fall. This restricts the availability of its deeper waters for coldwater fish species. The broad shallow, zone around the lake, however is a productive area for warmwater fish.

Incidental observations of mammals include Eastern Chipmunk, Red Fox, Coyote, Mink, Muskrat, Beaver, Ermine, Star-nosed Mole, Little Brown Bat, Big Brown Bat, Woodchuck, Meadow Vole, Short-tailed Shrew, Masked Shrew, Deer Mouse, Eastern Cottontail, Gray Squirrel, Red Squirrel, Raccoon, Striped Skunk and White-tailed Deer (pers. comm. David Green 2000). The Ermine is a species of concern in the TRCA watershed (TRCA 2001).

Table 3. Significant fauna

Status: L – locally rare or uncommon in the TRCA watershed with 20 or less stations (pers. comm. Lionel Normand 1999, 2001); s - species of concern in the TRCA watershed (TRCA 2001); p1 – conservation priority forest, wetland and open country bird species ranging from conservation priority level 1 (highest) to level 4 (lowest), based on Bird Studies Canada (Couturier 1999); f – forest bird species with the highest sensitivity to forest cover in southern Ontario (Cadman 1999, Couturier, 1999). Breeding bird status: o – Possible breeder, x – bird found in suitable habitat during the breeding season; Source: 1996 fieldwork S. Varga; 1978 TRCA fieldwork (Sheena Fennerty and Gwynneth Collishaw 1978); Gore & Storrie 1992 fieldwork (Gore & Storrie 1993); for the Mink, Ermine and Bullfrog pers. comm. David Green, 2000; for the Sharp-shinned Hawk, White-throated Sparrow and Pied-billed Grebe pres. comm. Lionel Normand and for Western Chorus Frog, pers. comm. Natalie Helferty 2000.

Breeding Birds

s p1	Virginia Rail	o	1996
s p4	Green Heron	o	1992
s p3 f	Ruffed Grouse	o	1978
p3 f	Alder Flycatcher	o	1992
p4	Black-capped Chickadee	o	1992
L s p2 f	Brown Creeper	x	1978
L s p3 f	Veery	o	2000, 1992, 1978
s p4 f	Wood Thrush	o	1992
s p2 f	Scarlet Tanager	x	1992, 1978
s p2 f	Northern Waterthrush	o	2000, 1992
p4	Gray Catbird	o	1992
p3	Eastern Phoebe	x	1978
s p2 f	American Redstart	x	2000, 1992, 1978
s p3 f	Black-and-White Warbler	o	2000, 1992, 1978
L s p1 f	Nashville Warbler	o	1992
L s p1 f	Sharp-shinned Hawk	o	2000
s p f	White-throated Sparrow	o	2000
L s p	Pied-billed Grebe	o	2000
p1	Savannah Sparrow	o	1992
p4	American Goldfinch	o	1992
s p3	Eastern Meadowlark	o	1992
s p2	Bobolink	o	1992
p2	Swamp Sparrow	o	1992

Amphibians

L s	Bullfrog	1990s
s	Northern Spring Peeper	1992, 1996

s	Wood Frog	1996
s	Western Chorus Forg	2000
L s	Northen Redbelly Snake	1978
Mammals		
s	Ermine	1990s

Conclusions

This inventory and the comparative work on other kettle lakes provides the basis for identifying Lake St. George as a provincial Area of Natural and Scientific Interest. It is the best example on the Oak Ridges Moraine of a coolwater headwater kettle lake, and it is noteworthy for its concentration of rare flora, its high quality open water aquatic communities, organic marshes and Water-willow low shrub swamp.

Kettle lakes are a feature inadequately represented in provincial ANSIs on the Oak Ridges Moraine. They can be divided into two major types: isolated kettle lakes and headwater kettle lakes. Isolated kettle lakes have no outflowing streams and the only inflows are generally surface run-off. These lakes often have small watersheds or catchments that may be only several times the size of the lake. Philips, Bond and Gibson lakes are the best examples of these isolated kettle lakes.

Lake St. George is an example of a headwater kettle lake. These lakes are situated in headwater areas, with a stream flowing from them and streams or seeps flowing into them. The best examples include Hackett, Thompson (King Twp.), Mary and St. George lakes. They are coolwater lakes noted for their fringing marshes and swamps and good water quality. This is attributable to their largely forested watersheds and their general lack of surrounding development.

In a comparison of these lakes, St. George, with the broadest shallow margins, has the most extensive open water aquatic community. It also has the best examples of Water-willow low shrub swamp, organic sedge marsh and Hard-stemmed Bulrush emergent marsh. The Water-willow low shrub swamp is a rare community type on the Oak Ridges Moraine (site district 6E7). The only other example occurs around Swan Lake, a 2.8 ha isolated kettle lake in the Lake Wilcox Kettle Wetlands & Uplands ANSI.

The ANSI fulfills the following five criteria for life science ANSI selection:

Representation

St. George provides excellent representation of an Oak Ridges Moraine coolwater headwater kettle lake. It has the Moraine's best representation of organic sedge

marsh, Water-willow low shrub swamp and Hard-stemmed Bulrush emergent marsh and a high quality example of an open water aquatic community.

Diversity

The ANSI is noteworthy for its diversity of 308 vascular plant species, 54 breeding bird species, 12 amphibian and reptile species, 15 fish species and 44 vegetation communities that range from open water to White Cedar conifer forests. A high diversity considering the ANSI is only 71.8 ha in size.

Special Features

It has a high concentration of 23 significant plant species and 29 significant bird, amphibian, reptile and mammal species.

Kettle lakes such as St. George are considered a rare ecosystem in southern Ontario and site district 6E7. On the Moraine there are only 32 kettle lakes covering about 307 ha, less than 0.2% of the Moraine's surface (OMNR 2001).

Condition

Lake St. George is noted for its generally good water quality and its lack of recent disturbance. Its water quality is probably attributable to its surrounding slopes that are largely forested or regenerating. The only development is a boathouse and a dock on its eastern shore. Up to 1983, much of the kettle slopes were pastured for dairy cattle. Since the Toronto and Region Conservation Authority acquired the lands, the former open pastures have been allowed to regenerate and the existing forests have started to recover.

St. George's forests are predominantly young stands. A serious problem in the forests and regenerating fields is the invasive European shrub, Common Buckthorn. Originally planted as a hedgerow on the Oak Ridges Moraine, it has invaded some of its forests and fields. Several small forest stands are also dominated by the introduced Horse Chestnut, Black Locust and Norway Maple.

An extension of Bayview Avenue will have impacts on several wetlands in the southwest corner of the ANSI, including the partial loss of a wetland that drains into Lake St. George. As well as a loss of wetland habitat, there may also be negative impacts to the ANSI's frog and turtle populations from the disruption of migration corridors.

Ecological Function

Areas of open water are rare on the Oak Ridges Moraine and are essential for many animal and plant

species. Lake St. George, with 10.4 ha of open water and 2 km of shoreline edge, is noteworthy for the Oak Ridges Moraine and site district 6E7. Its open waters are important as a migratory stopover for waterfowl and its fisheries, turtles and amphibians are diverse and healthy.

The Lake and its associated wetlands are a headwater source for the East Humber River with numerous groundwater seeps evident around the edge of the lake.

Areas of open water and its interface with terrestrial and wetland habitat are considered important to the diversity of animal and plant species. The lake is noteworthy for its species diversity and its high interspersion of wetland communities. One hectare of Lake St. George can include open water floating and submergent aquatic communities, organic sedge marshes, White Cedar swamps, Water-willow low shrub swamps and Hard Bulrush emergent beds.

Lake St. George is part of a network of connected natural areas situated in a former agricultural setting that is now regenerating. Resident Leopard Frogs and Toads forage in the surrounding agricultural lands and the lake's resident turtles also nest in the upland fields. Leopard Frogs from surrounding wetlands probably also utilize the lake bottom as a wintering hibernating site.

Recommendations

The scenic Lake St. George ANSI provides excellent representation of an Oak Ridges Moraine coolwater headwater kettle lake. Its associated wetlands support a high concentration of rare plant species including a rare water-willow low shrub swamp and the best example of an organic sedge marsh and Hard-stemmed Bulrush beds in the Moraine's lakes.

Lake St. George is sensitive to development, water taking and nutrient inputs in its surface catchment basin. Due to its sensitivity and significance, further development in its surface catchment basin would have negative impacts on its ANSI values. Protection should also be afforded to the groundwater catchment of the lake.

To further ensure the protection of Lake St. George, reforestation and natural regeneration should be encouraged in the remainder of the lake's catchment basin.

Broad ecological corridors around Lake St. George and the surrounding kettle wetlands of the Wilcox – St. George Wetland Complex need to be maintained and

strengthened. Studies have shown the importance of corridors in maintaining diversity and resiliency in an ecosystem (Riley and Mohr 1994, OMNR 2000). This is especially the case for critical habitats such as kettle lakes. Connections include one to the southeast with the Lake Wilcox Kettle Wetlands & Uplands ANSI along Bethesda Sideroad and to the east over to Haynes Lake and beyond. North and west there are connections to other kettle wetlands.

Serious consideration should be given to the removal of invasive exotic plants in the ANSI. The introduced European shrub, Common Buckthorn, is of greatest concern. Others of concern include Norway Maple, Black Locust and Horse Chestnut.

Strong consideration should be given to protecting frog migration corridors across the Bayview Avenue extension in and around the ANSI.

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Lake St. George Area of Natural and Scientific Interest



Ontario

NOTE

The information displayed on this map has been compiled from various sources. While every effort has been made to accurately depict the information, this map should be viewed as illustrative only.

For detailed information on the ANSI, the individual files held by the Aurora District Office of the Ministry of Natural Resources should be consulted.

Information Provided by the Ministry of Natural Resources,

Aurora District, Aurora, Ontario

Base information derived from the Ontario Base Map, 1983,
scale 1:10,000, Peterborough, Ontario

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N
Scale 1:10,000 (Approx.)
90 0 90 180 Metres



Area of Natural and Scientific
Interest (ANSI)

Woodland

Regenerating Area

Wetland

Kettle Bog

Kettle Lake

Urban Area

Road

Contour Line
(5 metre interval)

Intermittent Stream

Cold Water Stream



APPENDIX A:
VASCULAR PLANTS OF FIVE
AREAS OF NATURAL AND SCIENTIFIC INTEREST
ON THE OAK RIDGES MORAINE, TOWN OF RICHMOND HILL, ONTARIO

A total of 639 species have been recorded in the five ANSIs on the Richmond Hill portion of the Oak Ridges Moraine. Within each ANSI, 440 species are found in Jefferson Forest (J), 436 in Wilcox Lake Kettle Wetlands & Uplands (W), 353 in Bond Lake & Bog (B), 308 in Lake St. George (S) and 260 in Philips Lake (P).

Of the 639 species in the five ANSIs, 492 are native species, and 147 species have been introduced and are so noted with the symbol "+", or for possibly introduced with the symbol "(+)", in the status column. These introduced species constitute 24% of the flora. The botanical names and common names generally follow the Ontario Plant List, Newmaster et al. (1998).

Significant species are noted in the status column. Four species are provincially rare (P), 8 species are regionally rare (R) and 140 species are locally rare (L). Regionally rare species are defined for the Ministry of Natural Resources' former Central Region, an area covering the Greater Toronto Area and the regional municipalities of Niagara, Simcoe and Hamilton-Wentworth (Riley 1989). Locally rare species are known from 20 or less locations in the Ministry of Natural Resources' site district 6E7. A location is defined as a 2 km by 2 km block. The site district encompasses the Oak Ridges Moraine, the abutting South Slope and a portion of the Niagara Escarpment from central Halton to northern Simcoe regional Municipalities (Varga et al. 2001). Several difficult to identify plants have a lower cut-off for rarity of 10 locations or less (i.e. species in *Crataegus* and *Amelanchier* genera and those in the *Carex ovales* section). A species is also considered locally rare in site district 6E7, even if it is known from more than 20 locations if it is largely confined to habitats that occupy less than 0.5% of the site district, such as kettle bog, kettle lake, fen, prairie, sand barren or savannah habitats. Locally uncommon species (U) are known from 21-40 locations in site district 6E7 and are noted under the 6E7 site district column. The number of stations for locally rare species (R^X) in site district 6E7 is also noted under the 6E7 column.

The records are largely based on the collections and sight records of Steve Varga. Also included are the sight records and collections of Dan Gregory, Wasyl Bakowsky, Anthony Goodban and James Kamstra. Collections including historical (H) ones (50 years or older) are based on voucher specimens held in the herbarium at the Royal Ontario Museum, Botany Department (TRT) or the University of Toronto, Erindale College Herbarium (TRTE).

<u>Status</u>	<u>Species</u>	<u>Common Name</u>	<u>J</u>	<u>W</u>	<u>B</u>	<u>S</u>	<u>P</u>	<u>6E7</u>
	LYCOPODIACEAE	CLUB-MOSS FAMILY						
L	<i>Diphasiastrum tristachyum</i> (Pursh) Holub (<i>Lycopodium tristachyum</i> Pursh)	Blue Ground-cedar				X		R ⁴

<u>Status</u>	<u>Species</u>	<u>Common Name</u>	<u>J</u>	<u>W</u>	<u>B</u>	<u>S</u>	<u>P</u>	<u>6E7</u>
	<i>Huperzia lucidula</i> (Michx.) Trevis. (<i>Lycopodium lucidulum</i> Michx.)	Shining Club-moss	X	X				X
L	<i>Lycopodium clavatum</i> L.	Running Club-moss	X					R ¹⁶
L	<i>Lycopodium hickeyi</i> W.H. Wagner, Beitel & Moran (<i>L. obscurum</i> L. var. <i>isophyllum</i> Hickey)	Hickey's Ground-pine	X	X				R ²
EQUISETACEAE								
	<i>Equisetum arvense</i> L.	Field Horsetail	X	X	X	X	X	X
	<i>Equisetum fluviatile</i> L.	Water Horsetail	X	X	X	X	X	X
	<i>Equisetum hyemale</i> L. ssp. <i>affine</i> (Engelm.) Calder & Roy	Tall Scouring-rush	X	X		X		X
	<i>Equisetum scirpoideum</i> Michx.	Dwarf Scouring-rush	X					X
L	<i>Equisetum sylvaticum</i> L.	Woodland Horsetail				X		R ¹⁷
L	<i>Equisetum variegatum</i> Schleich. ex. Fried., Weber & Mohr ssp. <i>variegatum</i>	Variegated Horsetail					X	R ¹⁴
OPHIOGLOSSACEAE								
	<i>Botrychium virginianum</i> (L.) Sw.	Adder's-tongue Fern	X	X				X
OSMUNDACEAE								
	<i>Osmunda cinnamomea</i> L.	Cinnamon Fern	X	X				X
L	<i>Osmunda claytoniana</i> L.	Interrupted Fern	X					R ¹⁷
THELYPTERIDACEAE								
L	<i>Phegopteris connectilis</i> (Michx.) Watt (<i>Dryopteris phegopteris</i> (L.) Christens.; <i>Thelypteris phegopteris</i> (L.) Sloss.)	Northern Beech Fern	X					R ²⁰
L	<i>Thelypteris noveboracensis</i> (L.) Nieuwl. (<i>Dryopteris noveboracensis</i> (L.) A. Gray)	New York Fern	X					R ¹⁸
	<i>Thelypteris palustris</i> Schott var. <i>pubescens</i> (Lawson) Fern. (<i>Dryopteris thelypteris</i> (L.) A. Gray var. <i>pubescens</i> (Lawson) Nakai)	Marsh Fern	X	X	X	X	X	X

<u>Status</u>	<u>Species</u>	<u>Common Name</u>	<u>J</u>	<u>W</u>	<u>B</u>	<u>S</u>	<u>P</u>	<u>6E7</u>	
	DRYOPTERIDACEAE	WOOD FERN FAMILY							
	<i>Athyrium filix-femina</i> (L.) Roth ex Mert. var. <i>angustum</i> (Willd.) G. Lawson (<i>A. angustum</i> (Willd.) C. Presl)	Northern Lady Fern	X	X	X	X		X	
	<i>Cystopteris bulbifera</i> (L.) Bernh.	Bulblet Bladder Fern	X	X	X			X	
	<i>Dryopteris carthusiana</i> (Vill.) H.P. Fuchs (<i>D. austriaca</i> (Jacq.) Woynar var. <i>spinulosa</i> (O.F. Mueller) Fiori; <i>D. spinulosa</i> (O.F. Mueller) Watt)	Spinulose Wood Fern	X	X	X	X	X	X	
	<i>Dryopteris cristata</i> (L.) A. Gray	Crested Wood Fern	X	X	X		X	X	
	<i>Dryopteris intermedia</i> (Muhlenb. ex Willd.) A. Gray (<i>D. austriaca</i> (Jacq.) Woynar var. <i>intermedia</i> (Muhlenb. ex. Willd.) Morton; <i>D. spinulosa</i> (O.F. Mueller) Watt var. <i>intermedia</i> (Muhlenb. ex Willd.) L. Underw.)	Evergreen Wood Fern	X	X	X	X	X	X	
	<i>Dryopteris marginalis</i> (L.) A. Gray	Marginal Wood Fern	X	X	X			X	
	<i>Gymnocarpium dryopteris</i> (L.) Newman (<i>Dryopteris disjuncta</i> (Rupr.) C.V. Morton)	Oak Fern	X	X	X			X	
	<i>Matteuccia struthiopteris</i> (L.) Tod. var. <i>pensylvanica</i> (Willd.) C.V. Morton (<i>Pteretis pensylvanica</i> (Willd.) Fern.)	Ostrich Fern	X	X	X	X	X	X	
	<i>Onoclea sensibilis</i> L.	Sensitive Fern	X	X	X	X	X	X	
	<i>Polystichum acrostichoides</i> (Michx.) Schott	Christmas Fern	X	X				X	
	PINACEAE	PINE FAMILY							
	<i>Abies balsamea</i> (L.) Miller	Balsam Fir				X	X	X	
+	<i>Larix decidua</i> Miller	European Larch				X	X	X	
	<i>Larix laricina</i> (Du Roi) K. Koch	Tamarack	X	X	X	X	X	X	
+	<i>Picea abies</i> (L.) Karsten	Norway Spruce		X	X	X	X	X	
(+)	<i>Picea glauca</i> (Moench) Voss	White Spruce	X	X	X	X	X	X	
L	<i>Picea mariana</i> (Miller) B.S.P.	Black Spruce		X	X			R ¹⁹	
+	<i>Pinus resinosa</i> Sol. ex Aiton	Red Pine	X	X	X	X	X	X	
	<i>Pinus strobus</i> L.	Eastern White Pine	X	X	X	X	X	X	
+	<i>Pinus sylvestris</i> L.	Scot's Pine	X	X	X	X	X	X	
	<i>Tsuga canadensis</i> (L.) Carrière	Eastern Hemlock	X	X	X		X	X	

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	CUPRESSACEAE	CEDAR FAMILY						
L	<i>Juniperus communis</i> L. var. <i>depressa</i> Pursh	Common Juniper			X			R ¹⁶
	<i>Thuja occidentalis</i> L.	Eastern White Cedar	X	X	X	X	X	X
	TAXACEAE	YEW FAMILY						
	<i>Taxus canadensis</i> Marshall	American Yew	X	X		X		X
	ARISTOLOCHIACEAE	DUTCHMAN'S-PIPE FAMILY						
	<i>Asarum canadense</i> L.	Wild Ginger	X	X				X
	NYMPHAEACEAE	WATER-LILY FAMILY						
L	<i>Nuphar variegata</i> Durand in Clinton	Bullhead Pond Lily	X	X	X	X		R ²²
L	<i>Nymphaea odorata</i> Aiton (<i>N. tuberosa</i> Paine)	White Water-lily	X	X	X	X		R ¹⁹
	CABOMBACEAE	WATER-SHIELD FAMILY						
L	<i>Brasenia schreberi</i> J. Gmel.	Water-shield			X			R ³
	CERATOPHYLLACEAE	HORNWORT FAMILY						
L	<i>Ceratophyllum demersum</i> L.	Common Coontail		X	X	X		R ¹⁸
	RANUNCULACEAE	BUTTERCUP FAMILY						
	<i>Actaea pachypoda</i> Elliot (<i>A. alba</i> sensu Bibel.)	White Baneberry	X	X	X	X	X	X
	<i>Actaea rubra</i> (Aiton) Willd.	Red Baneberry	X	X	X	X	X	X
	<i>Actaea X ludovicii</i> B. Boivin (<i>A. pachypoda</i> X <i>A. rubra</i>)	Hybrid Baneberry	X					X
	<i>Anemone acutiloba</i> (DC.) G. Lawson (<i>Hepatica acutiloba</i> DC.)	Sharp-lobed Hepatica	X	X	X			X
L	<i>Anemone americana</i> (DC.) H. Hara (<i>Hepatica americana</i> (DC.) Ker. Gawler.)	Round-lobed Hepatica	X		H			R ⁹
	<i>Anemone canadensis</i> L.	Canada Anemone		X		X		X
	<i>Anemone cylindrica</i> A. Gray	Long-headed Anemone	X					X
L	<i>Anemone quinquefolia</i> L. var. <i>quinquefolia</i>	Wood Anemone	X					R ³

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	<i>Anemone virginiana</i> L. (incl. var. <i>alba</i> (Oakes) A.W. Wood (<i>A. riparia</i> Fern.); var. <i>cylindroidea</i> B. Boivin. and var. <i>virginiana</i>)	Thimbleweed	X	X	X	X	X	X
	<i>Aquilegia canadensis</i> L.	Wild Columbine	X	X	X			X
	<i>Clematis virginiana</i> L.	Virgin's-bower	X					X
	<i>Coptis trifolia</i> (L.) Salisb. (<i>C. trifolia</i> (L.) Salisb. ssp. <i>groenlandica</i> (Oeder) Hutton; <i>C. groenlandica</i> (Oeder) Fern.)	Goldthread	X	X				X
	<i>Ranunculus abortivus</i> L.	Kidney-leaf Buttercup	X	X	X	X	X	X
+	<i>Ranunculus acris</i> L.	Tall Buttercup	X	X	X	X	X	X
RL	<i>Ranunculus flabellaris</i> Raf.	Yellow Water Crowfoot		X		X		R ⁶
	<i>Ranunculus recurvatus</i> Poir.. var. <i>recurvatus</i>	Hooked Buttercup	X					X
	<i>Ranunculus scleratus</i> L.	Cursed Crowfoot				X		X
	<i>Thalictrum dioicum</i> L.	Early Meadow-rue	X	X	X		X	X
BERBERIDACEAE								
+	<i>Berberis thunbergii</i> DC.	Japanese Barberry	X	X	X	X		X
+	<i>Berberis vulgaris</i> L.	Common Barberry				X		X
	<i>Caulophyllum giganteum</i> (Farw.) Leconte & Blackwell	Blue Cohosh	X	X				X
	<i>Podophyllum peltatum</i> L.	May-apple	X	X		X		X
MENISPERMACEAE								
L	<i>Menispermum canadense</i> L.	Moonseed				X		R ⁷
PAPAVERACEAE								
+	<i>Chelidonium majus</i> L.	Celandine	X	X		X		X
	<i>Sanguinaria canadensis</i> L.	Bloodroot	X	X		X		X
HAMAMELIDACEAE								
L	<i>Hamamelis virginiana</i> L.	Witch-hazel	X	X			X	R ¹⁵

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	ULMACEAE	ELM FAMILY						
	<i>Ulmus americana</i> L.	American Elm	X	X	X	X	X	X
+	<i>Ulmus pumila</i> L.	Siberian Elm				X		X
	<i>Ulmus rubra</i> Muhlenb.	Red Elm		X				U
	CANNABACEAE	HEMP FAMILY						
+	<i>Cannabis sativa</i> L.	Marijuana		X				X
	URTICACEAE	NETTLE FAMILY						
	<i>Laportea canadensis</i> (L.) Wedd.	Wood Nettle	X					X
L	<i>Pilea fontana</i> (Lunell) Rydb.	Spring Clearweed	X	X				R ¹⁷
	<i>Pilea pumila</i> (L.) A. Gray	Dwarf Clearweed	X	X	X			X
	<i>Urtica dioica</i> L. ssp. <i>gracilis</i> (Aiton) Seland. (<i>U. procera</i> Muhlenb. ex Willd.)	American Stinging Nettle	X	X		X		X
	JUGLANDACEAE	WALNUT FAMILY						
	<i>Carya cordiformis</i> (Wangenh.) K. Koch	Bitternut Hickory	X	X	X		X	X
	<i>Juglans cinerea</i> L.	Butternut	X	X		X		X
+	<i>Juglans nigra</i> L.	Black Walnut			X	X	X	X
	FAGACEAE	BEECH FAMILY						
	<i>Fagus grandifolia</i> Ehrh.	American Beech	X	X	X	X	X	X
	<i>Quercus alba</i> L.	White Oak	X					U
	<i>Quercus rubra</i> L. (<i>Q. borealis</i> Michx. f.)	Red Oak	X	X	X	X	X	X
	BETULACEAE	BIRCH FAMILY						
	<i>Alnus incana</i> Moench ssp. <i>rugosa</i> (Du Roi) Clausen (<i>A. rugosa</i> Du Roi)	Speckled Alder			X			X
	<i>Betula alleghaniensis</i> Britton (<i>B. lutea</i> Michx. f.)	Yellow Birch	X	X	X			X
	<i>Betula papyrifera</i> Marshall	White Birch	X	X	X	X	X	X

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L	<i>Betula pumila</i> L. (<i>B. glandulifera</i> (Regel) Butler; <i>B. glandulosa</i> Michx. var. <i>glandulifera</i> (Regel) Gl.)	Swamp Birch		X				R ⁴
	<i>Carpinus caroliniana</i> Walter ssp. <i>virginiana</i> (Marshall) Fern.	Blue Beech	X	X			X	U
	<i>Corylus cornuta</i> Marshall ssp. <i>cornuta</i>	Beaked Hazel	X	X	X		X	X
	<i>Ostrya virginiana</i> (Miller) K. Koch	Ironwood	X	X	X	X	X	X
CHENOPodiaceae								
	GOOSEFOOT FAMILY							
+	<i>Chenopodium album</i> L.	Lamb's-quarters	X	X			X	X
+	<i>Chenopodium glaucum</i> L. (incl. ssp. <i>salinum</i> (Standley) Aellen and ssp. <i>glaucum</i>)	Oak-leaved Goosefoot		X				X
AMARANTHACEAE								
	AMARANTH FAMILY							
+	<i>Amaranthus powellii</i> S. Watson (<i>A. retroflexus</i> L. var. <i>powellii</i> (S. Watson) B. Boivin)	Green Pigweed					X	X
CARYOPHYLLACEAE								
	PINK FAMILY							
+	<i>Cerastium fontanum</i> Baumg. (<i>C. triviale</i> Link, <i>C. vulgatum</i> L.)	Mouse-eared Chickweed	X	X	X			X
+	<i>Dianthus armeria</i> L.	Deptford Pink	X					X
+	<i>Saponaria officinalis</i> L.	Bouncing Bet	X				X	X
+	<i>Silene noctiflora</i> L.	Night-flowering Catchfly		X				X
+	<i>Silene vulgaris</i> (Moench) Garcke (<i>S. cucubalus</i> Wibel; <i>S. latifolia</i> (Mill) Britton & Rendle)	Catchfly	X			X		X
+	<i>Stellaria media</i> (L.) Vill.	Common Chickweed				X		X
POLYGONACEAE								
	SMARTWEED FAMILY							
+	<i>Polygonum achoreum</i> Blake	Striate Knotweed	X					X
	<i>Polygonum amphibium</i> L. (<i>P. natans</i> Eaton; <i>P. coccineum</i> Muhlenb.)	Water Smartweed	X	X	X	X		X
	<i>Polygonum aviculare</i> L. (<i>P. monspeliacum</i> Thiebaud)	Prostrate Knotweed		X				X

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+	<i>Polygonum convolvulus</i> L. (<i>Bilderdykia convolvulus</i> (L.) Dumort.)	Black Bindweed	X					X
+	<i>Polygonum cuspidatum</i> Siebold. & Zucc. (<i>Reynoutria japonica</i> Houtt.)	Japanese Knotweed				X		X
(+)	<i>Polygonum hydropiper</i> L.	Water-pepper	X			X		X
L	<i>Polygonum hydropiperoides</i> Michx.	Mild Water-pepper				X	R ⁷	
+	<i>Polygonum persicaria</i> L.	Lady's Thumb	X	X	X	X		X
+	<i>Rumex acetosella</i> L. ssp. <i>acetosella</i>	Sheep Sorrel	X	X				X
+	<i>Rumex crispus</i> L.	Curly Dock	X	X	X	X		X
+	<i>Rumex obtusifolius</i> L. ssp. <i>obtusifolius</i>	Bitter Dock			X			X
	<i>Rumex orbiculatus</i> A. Gray	Great Water Dock		X	X	X		U
GUTTIFERAE								
ST. JOHN'S-WORT FAMILY								
+	<i>Hypericum perforatum</i> L.	Common St. John's-wort	X	X	X	X	X	X
	<i>Triadenium fraseri</i> (Spach) Gleason (<i>Hypericum virginicum</i> L. var. <i>fraseri</i> (Spach) Fern.)	Marsh St. John's-wort	X	X		X		U
TILIACEAE								
LINDEN FAMILY								
	<i>Tilia americana</i> L.	American Basswood	X	X	X	X	X	X
SARRACENIACEAE								
PITCHER-PLANT FAMILY								
L	<i>Sarracenia purpurea</i> L.	Pitcher-plant	X	X		X		R ¹⁷
DROSERACEAE								
SUNDEW FAMILY								
L	<i>Drosera rotundifolia</i> L.	Round-leaved Sundew	X	X	X		X	R ²⁰
CISTACEAE								
ROCK-ROSE FAMILY								
L	<i>Lechea intermedia</i> Legg.	Large-podded Pinweed	X	H				R ¹¹
VIOLACEAE								
VIOLET FAMILY								
	<i>Viola affinis</i> J. Le Conte	Le Conte's Violet	X					U
	<i>Viola blanda</i> Willd. (<i>V. incognita</i> Brianerd)	Sweet White Violet	X	X	X	X		X

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	<i>Viola canadensis</i> L.	Canada Violet	X	X				X
	<i>Viola conspersa</i> Reichb.	Dog Violet	X	X		X		X
	<i>Viola cucullata</i> Aiton	Marsh Blue Violet	X			X	X	X
	<i>Viola macloskeyi</i> F.E. Lloyd ssp. <i>pallens</i> (Banks ex DC.) M. Baker. (<i>V. pallens</i> (Banks ex DC.) Brainerd)	Northern White Violet		X	X			U
	<i>Viola pubescens</i> Aiton (<i>V. pubescens</i> Aiton var. <i>pubescens</i> ; <i>V. pubescens</i> Aiton var. <i>scabriuscula</i> T. & G.; <i>V. pensylvanica</i> Michx; <i>V. eriocarpa</i> Schwein)	Yellow Violet	X	X	X	X	X	X
	<i>Viola renifolia</i> A. Gray (<i>V. brainerdii</i> Greene)	Kidney-leaved Violet	X					U
	<i>Viola rostrata</i> Pursh	Long-spurred Violet	X	X				X
	<i>Viola selkirkii</i> Pursh ex Goldie	Selkirk's Violet	X	X				U
	<i>Viola sororia</i> Willd.	Whooolly Blue Violet	X	X	X	X	X	X
CUCURBITACEAE		GOULD FAMILY						
	<i>Echinocystis lobata</i> (Michx.) Torr. & Gray	Wild Cucumber	X	X	X	X		X
SALICACEAE		WILLOW FAMILY						
+	<i>Populus alba</i> L.	White Poplar	X			X		X
	<i>Populus balsamifera</i> L. ssp. <i>balsamifera</i>	Balsam Poplar	X	X	X	X	X	X
+	<i>Populus deltoides</i> Bartram ex Marshall	Eastern Cottonwood		X		X	X	X
	<i>Populus grandidentata</i> Michx.	Large-tooth Aspen	X	X	X	X	X	X
	<i>Populus tremuloides</i> Michx.	Trembling Aspen	X	X	X	X	X	X
+	<i>Salix alba</i> L. var. <i>alba</i>	White Willow				X		X
	<i>Salix amygdaloides</i> Anderss.	Peach-leaved Willow		X		X		U
	<i>Salix bebbiana</i> Sarg.	Bebb's Willow	X	X	X	X	X	X
L	<i>Salix candida</i> Flüegge ex Willd.	Hoary Willow				X		R ⁷
	<i>Salix discolor</i> Muhlenb.	Pussy Willow	X	X	X	X	X	X
	<i>Salix eriocephala</i> Michx. (<i>S. rigida</i> Muhlenb.)	Missouri Willow	X	X	X	X	X	X

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	<i>Salix exigua</i> Nutt. (<i>S. interior</i> Rowlee)	Sandbar Willow		X		X		U
L	<i>Salix humilis</i> Marshall	Upland Willow	X	X				R ¹²
	<i>Salix lucida</i> Muhlenb.	Shining Willow		X	X	X	X	X
L	<i>Salix pedicellaris</i> Pursh	Bog Willow		X	X		X	R ¹³
	<i>Salix petiolaris</i> Sm. (<i>S. gracilis</i> Anderss.)	Slender Willow	X	X	X	X	X	X
+	<i>Salix purpurea</i> L.	Purple Oiser				X		X
+	<i>Salix X rubens</i> Schrank (<i>S. alba</i> X <i>S. fragilis</i>)	Hybrid Crack Willow	X	X	X	X	X	X

BRASSICACEAE

MUSTARD FAMILY

+	<i>Alliaria petiolata</i> (M. Bieb.) Cavara & Grande (<i>A. officinalis</i> Andrz. ex M. Bieb.)	Garlic Mustard	X	X	X	X	X	X
+	<i>Barbarea vulgaris</i> R. Br.	Common Winter Cress		X	X	X	X	X
+	<i>Capsella bursa-pastoris</i> (L.) Medik.	Shepherd's-purse				X		X
	<i>Cardamine diphylla</i> (Michx.) Alph. Wood (<i>Dentaria diphylla</i> Michx.)	Two-leaved Toothwort	X	X				X
	<i>Cardamine pensylvanica</i> Muhlenb. ex Willd.	Pennsylvania Bitter Cress		X	X			U
RL	<i>Cardamine pratensis</i> L. ssp. <i>pratensis</i>	Cuckoo-flower				X		R ³
+	<i>Erysimum cheiranthoides</i> L. ssp. <i>cheiranthoides</i>	Wormseed Mustard				X	X	X
+	<i>Hesperis matronalis</i> L.	Dame's Rocket	X		X	X	X	X
+	<i>Nasturtium microphyllum</i> (Boenn.) Reichb. (<i>N. officinale</i> R. Br. var. <i>microphyllum</i> Boenn.)	Small-leaved Water-cress	X					X

ERICACEAE

HEATH FAMILY

L	<i>Andromeda polifolia</i> L. ssp. <i>glaucophylla</i> (Link) Hultén (<i>A. glaucophylla</i> Link)	Bog Rosemary		X	X			R ⁸
L	<i>Chamaedaphne calyculata</i> (L.) Moench	Leatherleaf		X	X		X	R ²⁴
L	<i>Gaultheria hispida</i> (L.) Muhlenb. ex Bigelow	Creeping Snowberry	X		H			R ¹⁹
	<i>Gaultheria procumbens</i> L.	Wintergreen	X	X	X		X	U
L	<i>Gaylussacia baccata</i> (Wangenh.) K. Koch	Black Huckleberry		X				R ⁹

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L	<i>Kalmia polifolia</i> Wangen.	Bog Laurel		X	X		X	R ¹³
L	<i>Ledum groenlandicum</i> Oeder	Labrador-tea		X	X	.		R ²⁵
L	<i>Vaccinium angustifolium</i> Aiton	Lowbush Blueberry	X	X				R ¹²
L	<i>Vaccinium macrocarpon</i> Aiton	Large Cranberry					X	R ¹⁵
L	<i>Vaccinium myrtilloides</i> Michx.	Velvet-leaf Blueberry	X	X	X			R ¹⁹
L	<i>Vaccinium oxycoccus</i> L.	Small Cranberry		X	X			R ¹²
PYROLACEAE								
WINTERGREEN FAMILY								
	<i>Chimaphila umbellata</i> (L.) Barton ssp. <i>cisatlantica</i> (S.F. Blake) Hultén	Common Pipsissewa	X	X				U
L	<i>Moneses uniflora</i> (L.) A. Gray	One-flowered Pyrola	X	X				R ²⁰
	<i>Orthilia secunda</i> (L.) House (<i>Pyrola secunda</i> L.)	One-sided Pyrola	X					U
	<i>Pyrola asarifolia</i> Michx.	Pink Pyrola	X	X		X		U
	<i>Pyrola elliptica</i> Nutt.	Shinleaf	X	X	X	X	X	X
MONOTROPACEAE								
INDIAN-PIPE FAMILY								
	<i>Monotropa hypopithys</i> L.	Pinesap	X					U
	<i>Monotropa uniflora</i> L.	Indian-pipe	X	X	X			U
PRIMULACEAE								
PRIMROSE FAMILY								
	<i>Lysimachia ciliata</i> L. (<i>Steironema ciliatum</i> (L.) Raf.)	Fringed Loosestrife	X	X	X	X		X
+	<i>Lysimachia nummularia</i> L.	Moneywort	X	X	X			X
	<i>Lysimachia thrysiflora</i> L.	Tufted Loosestrife		X	X	X	X	U
	<i>Trientalis borealis</i> Raf. ssp. <i>borealis</i>	Star-flower	X	X				X
GROSSULARIACEAE								
GOOSEBERRY FAMILY								
	<i>Ribes americanum</i> Miller	Wild Black Currant	X	X		X		X
	<i>Ribes cynosbati</i> L.	Prickly Gooseberry	X	X	X	X	X	X
L	<i>Ribes glandulosum</i> Grauer	Skunk Currant		X				R ¹⁷

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+	<i>Ribes rubrum</i> L. (<i>R. sylvestre</i> (Lam.) Mert. & Koch; <i>R. sativum</i> (Reichenb.) Syme)	Red Currant				X	X	X
	<i>Ribes triste</i> Pall.	Swamp Red Current	X	X				X
	SAXIFRAGACEAE	SAXIFRAGE FAMILY						
	<i>Mitella diphylla</i> L.	Two-leaved Bishop's Cap	X	X				X
	<i>Mitella nuda</i> L.	Naked Mitrewort	X	X				X
	<i>Penthorum sedoides</i> L.	Ditch Stonecrop		X				U
	<i>Tiarella cordifolia</i> L.	Foam Flower	X					X
	ROSACEAE	ROSE FAMILY						
	<i>Agrimonia gryposepala</i> Wallr.	Hooked Agrimony	X	X	X	X	X	X
	<i>Amelanchier arborea</i> (Michx. f.) Fern.	Downy Juneberry	X	X	X		X	X
	<i>Amelanchier laevis</i> Wiegand	Smooth Juneberry	X	X				U
	<i>Amelanchier sanguinea</i> (Pursh) DC. var. <i>sanguinea</i>	Roundleaf Juneberry	X					U
	<i>Amelanchier spicata</i> (Lam.) K. Koch	Low Juneberry	X	X	X	X		U
L	<i>Aronia melanocarpa</i> (Michx.) Elliot (<i>Aronia prunifolia</i> (Marshall) Rehder; <i>Pyrus floribunda</i> Lindl..)	Black Chokeberry		X	X		X	R ¹⁸
	<i>Crataegus macracantha</i> Lodd. (<i>C. succulenta</i> Schrad. ex Link var. <i>macracantha</i> (Loud.) Eggleston)	Large-throned Hawthorn	X	X	X	X	X	X
L	<i>Crataegus macrosperma</i> Ashe	Variable Hawthorn	X	X	X		X	R ⁴
+	<i>Crataegus monogyna</i> Jacq.	English Hawthorn			X	X		X
	<i>Crataegus pedicellata</i> Sarg.	Pedicelled Hawthorn	X	X	X			X
L	<i>Crataegus pringlei</i> Sarg.	Pringle's Hawthorn	X	X	X		X	R ⁷
	<i>Crataegus punctata</i> Jacq.	Dotted Hawthorn		X	X			X
	<i>Fragaria vesca</i> L. ssp. <i>americana</i> (Porter) Staudt	Woodland Strawberry	X	X	X	X	X	X
	<i>Fragaria virginiana</i> Miller	Wild Strawberry	X	X	X	X	X	X
	<i>Geum aleppicum</i> Jacq. (<i>G. strictum</i> Aiton)	Yellow Avens	X	X	X	X		X
	<i>Geum canadense</i> Jacq.	White Avens	X	X	X	X	X	X

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+	<i>Geum urbanum</i> L.	Wood Avens				X		X
+	<i>Malus pumila</i> Miller (<i>Malus domestica</i> Borkh.; <i>Pyrus malus</i> L.)	Common Crabapple	X	X	X	X	X	X
+	<i>Potentilla argentea</i> L.	Silvery Cinquefoil	X	X				X
+	<i>Potentilla norvegica</i> L. ssp. <i>norvegica</i>	Rough Cinquefoil		X		X		X
L	<i>Potentilla palustris</i> (L.) Scop.	Marsh Cinquefoil		X	X	X	X	R ²⁰
+	<i>Potentilla recta</i> L.	Rough-fruited Cinquefoil	X	X	X	X	X	X
	<i>Prunus nigra</i> Aiton	Canada Plum		X				U
	<i>Prunus pensylvanica</i> L. f.	Pin Cherry	X	X		X	X	X
	<i>Prunus serotina</i> Ehrh.	Black Cherry	X	X	X		X	X
	<i>Prunus virginiana</i> L. ssp <i>virginiana</i>	Choke Cherry	X	X	X	X	X	X
	<i>Rosa blanda</i> Aiton	Smooth Rose	X	X	X	X	X	X
+	<i>Rosa multiflora</i> Thunb. ex Murrey	Multiflora Rose	X				X	X
	<i>Rubus allegheniensis</i> Porter	Common Blackberry	X	X	X	X	X	X
L	<i>Rubus flagellaris</i> Willd.	Northern Dewberry	X					R ⁷
	<i>Rubus idaeus</i> L. ssp. <i>melanolasmus</i> (Dieck) Focke (<i>Rubus strigosus</i> Michx.)	Wild Red Raspberry	X	X	X	X	X	X
	<i>Rubus occidentalis</i> L.	Black Raspberry	X	X	X	X		X
	<i>Rubus odoratus</i> L.	Purple Flowering Raspberry	X	X	X		X	X
	<i>Rubus pubescens</i> Raf.	Dwarf Raspberry	X	X	X	X		X
+	<i>Sorbus aucuparia</i> L. (<i>Pyrus aucuparia</i> (L.) Gaertn.)	European Mountain-ash	X	X	X	X	X	X
	<i>Spiraea alba</i> Du Roi (<i>S. latifolia</i> (Aiton) Borkh.)	Narow-leaved Meadow-sweet		X	X	X	X	X
	<i>Waldsteinia fragarioides</i> (Michx.) Tratt.	Barren Strawberry	X	X	X			X
FABACEAE		PEA FAMILY						
	<i>Amphicarpaea bracteata</i> (L.) Fern.	Hog Peanut	X	X	X			X
+	<i>Coronilla varia</i> L.	Variable Crown-vetch	X				X	X
	<i>Desmodium canadense</i> (L.) DC.	Showy Tick-trefoil	X	X				U

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	<i>Desmodium glutinosum</i> (Muhlenb. ex Willd) Alph. Wood	Pointed-leaved Tick-trefoil	X	X			X	U
+	<i>Gleditsia triacanthos</i> L.	Honey Locust				X		X
+	<i>Lotus corniculatus</i> L.	Bird's-foot Trefoil	X	X		X	X	X
+	<i>Medicago lupulina</i> L.	Black Medick	X	X	X	X	X	X
+	<i>Medicago sativa</i> L. ssp. <i>sativa</i>	Alfalfa	X					X
+	<i>Melilotus alba</i> Medik.	White Sweet-clover	X	X	X	X	X	X
+	<i>Robinia pseudo-acacia</i> L.	Black Locust	X	X		X	X	X
+	<i>Trifolium hybridum</i> L. ssp. <i>elegans</i> (Savi) Asch. & Graebn.	Alsike Clover		X				X
+	<i>Trifolium pratense</i> L.	Red Clover	X	X	X	X	X	X
+	<i>Trifolium repens</i> L.	White Clover	X	X	X	X	X	X
+	<i>Vicia cracca</i> L.	Cow Vetch	X	X	X	X	X	X
+	<i>Vicia sativa</i> L. ssp. <i>nigra</i> (L.) Ehrh. (<i>V. angustifolia</i> Reich.; <i>V. sativa</i> L var. <i>angustifolia</i> (L.) Wahlenb.)	Spring Vetch	X					X
+	<i>Vicia villosa</i> Roth	Hairy Vetch		X	X	X		X
ELAEAGNACEAE								
L	<i>Shepherdia canadensis</i> (L.) Nutt.	OLEASTER FAMILY						
		Canada Soapberry	X	X	X		X	R ²⁰
HALORAGACEAE								
+	<i>Myriophyllum spicatum</i> L.	WATER-MILFOIL FAMILY						
		Eurasian Water-milfoil			X			X
LYTHRACEAE								
L	<i>Decodon verticillatus</i> (L.) Elliott	LOOSESTRIFE FAMILY						
		Water-willow		X	X	X		R ¹³
+	<i>Lythrum salicaria</i> L.	Purple Loosestrife	X	X	X	X	X	X
THYMELAEACEAE								
		MEZEREUM FAMILY						
	<i>Dirca palustris</i> L.	Leatherwood		X				U
ONAGRACEAE								
		EVENING-PRIMROSE FAMILY						
	<i>Circaeaa alpina</i> L.	Small Enchanter's Nightshade	X	X	X			X

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	<i>Ciraea lutetiana</i> L. ssp. <i>canadensis</i> (L.) Aschers & Magnusson (<i>C. quadrifolia</i> (Maxim.) Franchet & Savat.)	Enchanter's-nightshade	X	X	X	X	X	X
	<i>Epilobium ciliatum</i> Raf	Northern Willow-herb	X	X	X	X	X	X
	<i>Epilobium hirsutum</i> L.	Great Hairy Willow Herb				X		X
	<i>Epilobium leptophyllum</i> Raf.	Narrow-leaved Willow-herb	X		X			U
+	<i>Epilobium parviflorum</i> Schreb.	Sparse-flowered Willow-herb	X		X	X		X
	<i>Oenothera biennis</i> L.	Common Evening-primrose	X	X		X		U
	<i>Oenothera parviflora</i> L.	Small-flowered Evening-primrose		X				X
CORNACEAE								
	<i>Cornus alternifolia</i> L.f.	Alternate-leaved Dogwood	X	X	X	X	X	X
	<i>Cornus foemina</i> Miller ssp. <i>racemosa</i> (Lam.) J.S. Wilson (<i>C. racemosa</i> Lam.)	Grey Dogwood				X		U
	<i>Cornus rugosa</i> Lam.	Round-leaved Dogwood	X	X	X		X	X
	<i>Cornus stolonifera</i> Michx.	Red-osier Dogwood	X	X	X	X	X	X
VISCACEAE								
L	<i>Arceuthobium pusillum</i> Peck	Dwarf Mistletoe		H				R ¹
CELASTRACEAE								
	<i>Celastrus scandens</i> L.	Climbing Bittersweet	X	X	X	X		X
PRL	<i>Euonymus atropurpurea</i> Jacq. var. <i>atropurpurea</i>	Burning Bush	X					R ¹
AQUIFOLIACEAE								
	<i>Ilex verticillata</i> (L.) A. Gray	Winterberry	X	X	X		X	X
L	<i>Nemopanthus mucronatus</i> (L.) Loeske	Mountain-holly		X	X			R ¹⁹
RHAMNACEAE								
	<i>Rhamnus alnifolia</i> L'Hér.	Alder-leaved Buckthorn	X					U
+	<i>Rhamnus cathartica</i> L.	Common Buckthorn	X	X	X	X	X	X

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VITACEAE								
GRAPE FAMILY								
	<i>Parthenocissus inserta</i> (A. Kern.) Fritsch (<i>P. vitacea</i> (Knerr) Hitchc.)	Thicket Virginia-creeper		X	X	X	X	X
	<i>Vitis riparia</i> Michx.	Riverbank Grape		X	X	X	X	X
POLYGALACEAE								
MILKWORT FAMILY								
	<i>Polygala paucifolia</i> Willd.	Fringed Polygala		X	X	X		U
ACERACEAE								
MAPLE FAMILY								
+	<i>Acer negundo</i> L.	Manitoba Maple		X	X	X	X	X
+	<i>Acer platanoides</i> L.	Norway Maple			X	X	X	X
	<i>Acer rubrum</i> L.	Red Maple		X	X	X	X	X
	<i>Acer saccharinum</i> L.	Silver Maple		X	X	X	X	X
	<i>Acer saccharum</i> Marshall <i>ssp. saccharum</i>	Sugar Maple		X	X	X	X	X
	<i>Acer spicatum</i> Lam.	Mountain Maple		X	X			X
	<i>Acer X freemanii</i> E. Murr. (<i>A. rubrum</i> L. X <i>A. saccharinum</i> L.)	Hybrid Soft Maple		X	X			X
ANACARDIACEAE								
SUMAC FAMILY								
	<i>Rhus rydbergii</i> Small ex Rydb. (<i>Rhus radicans</i> ssp. <i>rydbergii</i> (Small ex Rydb.) McNeill; <i>Toxicodendron rydbergii</i> (Sm. ex Rehder) Greene; <i>Rhus toxicodendron</i> L.var. <i>rydbergii</i> (Sm. ex Rydb.) Garrett)	Creeping Poison-ivy		X	X	X	X	X
	<i>Rhus typhina</i> L.	Staghorn Sumac		X	X	X	X	X
OXALIDACEAE								
WOOD SORREL FAMILY								
L	<i>Oxalis acetosella</i> L. <i>ssp. montana</i> (Raf.) Hutton (<i>O. montana</i> Raf.)	True Wood-sorrel			X			R ¹⁹
+	<i>Oxalis stricta</i> L. (<i>O. europaea</i> Jordon; <i>O. fontana</i> Bunge)	Common Wood-sorrel		X	X	X	X	X
GERANIACEAE								
GERANIUM FAMILY								
L	<i>Geranium maculatum</i> L.	Wild Geranium			X			R ¹³

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+	<i>Geranium robertianum</i> L.	Herb Robert	X	X	X	X		X
BALSAMINACEAE		TOUCH-ME-NOT FAMILY						
	<i>Impatiens capensis</i> Meerb. (<i>I. biflora</i> Walter)	Spotted Jewelweed	X	X	X	X	X	X
	<i>Impatiens pallida</i> Nutt.	Pale Jewelweed				X		U
ARALIACEAE		GINSENG FAMILY						
	<i>Aralia nudicaulis</i> L.	Wild Sarsaparilla	X	X	X	X	X	X
	<i>Aralia racemosa</i> L. ssp. <i>racemosa</i>	Spikenard	X					U
APIACEAE		CARROT FAMILY						
+	<i>Aegopodium podagraria</i> L.	Goutweed				X		X
	<i>Cicuta bulbifera</i> L.	Bulb-bearing Water-hemlock	X	X	X	X	X	X
	<i>Cicuta maculata</i> L.	Spotted Water-hemlock	X	X		X		U
	<i>Cryptotaenia canadensis</i> (L.) DC.	Honewort	X					U
+	<i>Daucus carota</i> L.	Wild Carrot	X	X	X	X	X	X
	<i>Hydrocotyle americana</i> L.	Marsh Pennywort	X					U
	<i>Osmorhiza claytonii</i> (Michx.) C.B. Clarke	Wooly Sweet-cicely	X	X				X
	<i>Sanicula marilandica</i> L.	Common Sancile	X	X				X
	<i>Sium suave</i> Walter	Water-parsnip		X	X	X	X	X
GENTIANACEAE		GENTIAN FAMILY						
RL	<i>Gentianopsis crinita</i> (Froel.) Ma (<i>Gentiana crinita</i> Froel.; <i>Gentianella crinita</i> (Froel.) G. Don)	Fringed Gentian	X					R ²
APOCYNACEAE		DOGBANE FAMILY						
	<i>Apocynum androsaemifolium</i> L. ssp. <i>androsaemifolium</i>	Spreading Dogbane	X	X	X		X	X
	<i>Apocynum cannabinum</i> L. (incl. var. <i>cannabinum</i> and var. <i>hypericifolium</i> A. Gray (<i>A. sibiricum</i> Jacq.))	Indian Hemp	X			X		U
+	<i>Vinca minor</i> L.	Common Periwinkle	X	X		X		X

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ASCLEPIADACEAE								
L	<i>Asclepias exaltata</i> L.	Poke Milkweed	X	X				R ⁷
	<i>Asclepias incarnata</i> L. ssp. <i>incarnata</i>	Swamp Milkweed	X	X	X	X		X
	<i>Asclepias syriaca</i> L.	Common Milkweed	X	X	X	X	X	X
+	<i>Cynanchum rossicum</i> (Kleopov) Borhidi (<i>Cynanchum medium</i> R. Br.; <i>Vincetoxicum rossicum</i> (Kleopov) Barbar.)	Pale Swallow-wort				X		X
SOLANACEAE								
	<i>Physalis heterophylla</i> Nees	Clammy Ground-cherry	X			X		U
+	<i>Solanum dulcamara</i> L.	Bitter Nightshade	X	X	X	X	X	X
+	<i>Solanum ptycanthum</i> Dunel ex DC. (<i>S. americanum</i> Miller; <i>S. nigrum</i> L.)	Eastern Black Nightshade			X			X
CONVOLVULACEAE								
	<i>Calystegia sepium</i> (L.) R. Br. (<i>Convolvulus sepium</i> L.)	Hedge Bindweed	X	X				U
L	<i>Calystegia spithamea</i> (L.) Pursh	Low Bindweed			X			R ¹⁸
MENYANTHACEAE								
L	<i>Menyanthes trifoliata</i> L.	Bog Buckbean		X	X		X	R ¹¹
HYDROPHYLACEAE								
	<i>Hydrophyllum virginianum</i> L.	Virginia Water-leaf	X	X	X	X		X
BORAGINACEAE								
+	<i>Echium vulgare</i> L.	Viper's Bugloss	X				X	X
	<i>Myosotis laxa</i> Lehm.	Smaller Forget-me-not	X	X	X			X
+	<i>Myosotis scorpioides</i> L.	True Forget-me-not			X	X		X
+	<i>Myosotis sylvatica</i> H. Hoffm.	Garden Forget-me-not	X		X			X
VERBENACEAE								
	<i>Verbena hastata</i> L.	Blue Vervain		X				X
	<i>Verbena urticifolia</i> L.	White Vervain		X				X

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LAMIACEAE								
MINT FAMILY								
	<i>Clinopodium vulgare</i> L. (<i>Satureja vulgaris</i> (L.) Fritsch)	Wild Basil	X	X	X - X			X
+	<i>Galeopsis tetrahit</i> L.	Common Hemp-nettle		X	X	X		X
+	<i>Leonurus cardiaca</i> L. ssp. <i>cardiaca</i>	Common Motherwort	X	X	X	X	X	X
	<i>Lycopus americanus</i> Muhlenb. ex Bartram	American Water-horehound	X	X		X		X
	<i>Lycopus uniflorus</i> Michx.	Northern Water-horehound	X	X	X	X	X	X
	<i>Mentha arvensis</i> L.	Field Mint	X	X	X	X	X	X
	<i>Monarda fistulosa</i> L.	Wild Bergamot	X	X				X
+	<i>Nepeta cataria</i> L.	Catnip	X			X		X
	<i>Prunella vulgaris</i> L. (incl. ssp. <i>lanceolata</i> (W. C. Barton) Hultén and ssp. <i>vulgaris</i>)	Heal-all	X	X	X	X	X	X
	<i>Scutellaria galericulata</i> L. (<i>S. epilobiifolia</i> A. Ham.)	Marsh Skullcap		X	X	X	X	X
	<i>Scutellaria lateriflora</i> L.	Mad-dog Skullcap	X	X	X	X		X
PLANTAGINACEAE								
PLANTAIN FAMILY								
+	<i>Plantago lanceolata</i> L.	Narrow-leaved Plantain	X	X	X	X		X
+	<i>Plantago major</i> L.	Common Plantain	X	X	X	X	X	X
	<i>Plantago rugelii</i> Decne.	Rugel's Plantain	X	X	X	X		X
OLEACEAE								
OLIVE FAMILY								
	<i>Fraxinus americana</i> L.	White Ash	X	X	X	X	X	X
	<i>Fraxinus nigra</i> Marshall	Black Ash	X	X				X
	<i>Fraxinus pennsylvanica</i> Marshall (incl. var. <i>pennsylvanica</i> and var. <i>subintegerrima</i> (Vahl) Fern.)	Green Ash, Red Ash	X		X	X		X
+	<i>Syringa vulgaris</i> L.	Common Lilac	X		X	X		X
SCROPHULARIACEAE								
FIGWORT FAMILY								
+	<i>Chaenorhinum minus</i> (L.) Lange	Dwarf Snapdragon	X					X
+	<i>Linaria vulgaris</i> Miller	Butter-and-eggs	X		X	X		X

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	<i>Mimulus ringens</i> L.	Square-stemmed Monkey-flower		X				U
L	<i>Pedicularis canadensis</i> L.	Canada Wood-betony	X					R ¹³
+	<i>Verbascum thapsus</i> L.	Common Mullein	X	X	X	X	X	X
	<i>Veronica americana</i> (Raf.) Schwein. ex Benth	American Speedwell	X					U
+	<i>Veronica officinalis</i> L.	Common Speedwell	X	X	X	X	X	X
L	<i>Veronica scutellata</i> L.	Marsh Speedwell		X	X			R ⁹
+	<i>Veronica serpyllifolia</i> L. ssp. <i>serpyllifolia</i>	Thyme-leaved Speedwell	X					X
OROBANCHACEAE								
	<i>Epifagus virginiana</i> (L.) Barton	Beech-drops	X	X	X			X
LENTIBULARIACEAE								
L	<i>Utricularia vulgaris</i> L.	Common Bladderwort					X	R ¹⁶
CAMPANULACEAE								
L	<i>Campanula aparinoides</i> Pursh (incl. <i>C. uliginosa</i> Rydb.)	Marsh Bellflower				X		R ¹⁷
+	<i>Campanula rapunculoides</i> L.	Creeping Bellflower	X		X			X
	<i>Lobelia inflata</i> L.	Indian Tobacco	X	X		X		X
	<i>Lobelia siphilitica</i> L.	Great Lobelia	X			X		U
RUBIACEAE								
	<i>Galium aparine</i> L.	Cleavers		X				U
	<i>Galium asperellum</i> Michx.	Rough Bedstraw				X		U
	<i>Galium lanceolatum</i> Torr.	Spear Wild Licorice	X	X				U
+	<i>Galium mollugo</i> L.	Hedge Bedstraw	X					X
	<i>Galium palustre</i> L.	Marsh Bedstraw	X		X	X	X	X
	<i>Galium tinctorium</i>	Stiff Marsh Bedstraw	X	X		X		U
	<i>Galium trifidum</i> L. var. <i>trifidum</i>	Small Bedstraw			X			U
	<i>Galium triflorum</i> Michx.	Sweet-scented Bedstraw	X	X	X	X		X
+	<i>Galium verum</i> L.	Yellow Bedstraw	X	X	X	X	X	X

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	<i>Mitchella repens</i> L.	Partridge-berry	X	X				X
CAPRIFOLIACEAE		HONEYSUCKLE FAMILY						
	<i>Diervilla lonicera</i> Miller	Bush Honeysuckle	X	X	X		X	X
	<i>Linnaea borealis</i> L.. ssp. <i>longiflora</i> (Torr.) Hultén	Twinflower	X					U
	<i>Lonicera canadensis</i> Bartram	Canada Fly Honeysuckle	X	X				X
	<i>Lonicera dioica</i> L.	Glaucous Honeysuckle	X	X	X		X	X
L	<i>Lonicera hirsuta</i> Eaton	Hairy Honeysuckle		X				R ¹⁵
+	<i>Lonicera tatarica</i> L.	Tartarian Honeysuckle		X	X	X	X	X
+	<i>Lonicera X bella</i> Zabel (<i>L. tatarica</i> X <i>L. morrowii</i>)	Bell's Honeysuckle	X		X			X
	<i>Sambucus canadensis</i> L.	Common Elder	X	X	X	X		X
	<i>Sambucus racemosa</i> L. ssp. <i>pubens</i> (Michx.) House (<i>S. pubens</i> Michx.)	Red-berried Elder	X	X	X	X	X	X
	<i>Symporicarpos albus</i> (L.) S.F. Blake var. <i>albus</i>	Snowberry	X			X		U
	<i>Viburnum acerifolium</i> L.	Maple-leaved Viburnum	X	X	X	X	X	X
L	<i>Viburnum cassinoides</i> L.	Northern Wild Raisin		X				R ⁸
+	<i>Viburnum lantana</i> L.	Wayfaring Tree			X		X	X
L	<i>Viburnum lantanoides</i> Michx. (<i>V. alnifolium</i> Marshall)	Hobblebush		X				R ¹⁶
	<i>Viburnum lentago</i> L.	Nannyberry	X	X		X	X	X
+	<i>Viburnum opulus</i> L.	European Highbush Cranberry	X	X	X	X	X	X
L	<i>Viburnum rafinesquianum</i> Schult.	Downy Arrow-wood		X			X	R ⁹
	<i>Viburnum trilobum</i> Marshall (<i>V. opulus</i> L. var. <i>americanum</i> (Miller) Aiton)	American Bush-cranberry	X	X	X		X	U
ASTERACEAE		ASTER FAMILY						
+	<i>Achillea millefolium</i> L. ssp. <i>millefolium</i>	Common Yarrow	X	X	X	X	X	X
	<i>Ambrosia artemisiifolia</i> L.	Common Ragweed	X	X	X	X	X	X
	<i>Antennaria neglecta</i> Greene	Field Pussytoes	X	X	X	X		X

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	<i>Antennaria parlinii</i> Fern. ssp. <i>fallax</i> (E. Greene) R.J. Bayer & Stebb. (<i>A. plantaginifolia</i> (L.) Richards; (<i>A. munda</i> Fern.)	Parlin's Pussytoes	X	X	X			U
+	<i>Arctium minus</i> (Hill) Bernh. ssp. <i>minus</i>	Common Burdock	X	X	X	X	X	X
	<i>Aster cordifolius</i> L.	Heart-leaved Aster	X	X	X	X	X	X
	<i>Aster ericoides</i> L. (<i>Virgulus ericoides</i> (L.) Reveal & Keen.)	Heath Aster	X					X
	<i>Aster laevis</i> L. var. <i>laevis</i>	Smooth Aster	H					H
	<i>Aster lanceolatus</i> Willd. ssp. <i>lanceolatus</i> (<i>A. simplex</i> Willd.)	Panicled Aster	X	X	X	X	X	X
	<i>Aster lateriflorus</i> (L.) Britton	Calico Aster	X		X	X		X
	<i>Aster macrophyllus</i> L.	Large-leaved Aster	X	X	X	X	X	X
	<i>Aster novae-angliae</i> L. (<i>Virgulus novae-angliae</i> (L.) Reveal & Keen.)	New England Aster	X	X	X	X	X	X
RL	<i>Aster ontarionis</i> Wiegand	Lake Ontario Aster			X			R ⁹
	<i>Aster oolentangiensis</i> Riddell (<i>A. azureus</i> Lindl.)	Sky-blue Aster	X	X				U
	<i>Aster puniceus</i> L.	Purple-stemmed Aster	X	X	X	X		X
	<i>Aster urophyllus</i> Lindl. (<i>A. sagittifolius</i> Wedenmeyer ex Willd.)	Arrow-leaved Aster	X	X				X
	<i>Bidens cernua</i> L.	Nodding Beggar-ticks	X	X	X	X		X
L	<i>Bidens discoidea</i> (Torr. & A. Gray) Britton	Small Beggar-ticks			X			R ⁷
	<i>Bidens frondosa</i> L.	Devil's Beggar-ticks	X	X	X	X	X	X
	<i>Bidens tripartitus</i> L. (incl. <i>B. comosa</i> (A. Gray) Wiegand, <i>B. connata</i> Muhlenb. ex Willd.)	Three-parted Beggar-ticks	X	X	X	X		X
L	<i>Bidens vulgata</i> Greene	Tall Beggar-ticks	X	X				R ¹⁵
+	<i>Carduus acanthoides</i> L.	Plumeless Thistle	X					X
+	<i>Centaurea maculosa</i> Lam.	Spotted Knapweed	X	X				X
+	<i>Chrysanthemum leucanthemum</i> L. (<i>Leucanthemum vulgare</i> Lam.)	Ox-eye Daisy	X	X	X	X	X	X
+	<i>Cichorium intybus</i> L.	Chicory	X	X	X	X		X

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+	<i>Cirsium arvense</i> (L.) Scop.	Canada Thistle	X	X	X	X	X	X
RL	<i>Cirsium discolor</i> (Muhlenb. ex Willd.) Spreng.	Field Thistle		X				R ²
+	<i>Cirsium vulgare</i> (Savi) Ten.	Bull Thistle	X	X	X	X	X	X
	<i>Conyza canadensis</i> (L.) Cronquist (<i>Erigeron canadensis</i> L.)	Horseweed	X	X				X
+	<i>Crepis tectorum</i> L.	Narrow-leaved Hawk's Beard				X		X
	<i>Erigeron annuus</i> (L.) Pers. (<i>Erigeron annus</i> (L.) Pers. ssp. <i>annus</i>)	Daisy Fleabane	X	X	X	X	X	X
	<i>Erigeron philadelphicus</i> L. ssp. <i>philadelphicus</i>	Philadelphia Fleabane	X	X	X	X	X	X
	<i>Eupatorium maculatum</i> L. ssp <i>maculatum</i>	Spotted Joe-pye-weed	X			X		X
	<i>Eupatorium perfoliatum</i> L.	Boneset	X	X	X	X		X
	<i>Eupatorium rugosum</i> Houtt.	White Snakeroot	X	X				X
	<i>Euthamia graminifolia</i> (L.) Nutt. (<i>Solidago graminifolia</i> (L.) Salisb.)	Grass-leaved Goldenrod	X			X	X	X
	<i>Helianthus tuberosus</i> L.	Jerusalem Artichoke	X	X		X		X
L	<i>Helianopsis helianthoides</i> (L.) Sweet	Fake Sunflower	X					R ¹
+	<i>Hieracium caespitosum</i> Dum. ssp. <i>caespitosum</i> (<i>H. pratense</i> Tausch)	Field Hawkweed	X	X	X	X	X	X
L	<i>Hieracium kalmii</i> L. (<i>H. canadensis</i> Michx.)	Canada Hawkweed			H			H
+	<i>Hieracium piloselloides</i> Vill. (<i>H. florentinum</i> All.)	Glaucous King Devil	X			X		X
+	<i>Inula helenium</i> L.	Elecampane	X	X		X		X
	<i>Lactuca biennis</i> (Moench) Fern.	Tall Blue Lettuce	X					U
	<i>Lactuca canadensis</i> L.	Wild Lettuce	X					U
+	<i>Lactuca serriola</i> L. (<i>L. scariola</i> L.)	Prickly Lettuce	X					X
+	<i>Lapsana communis</i> L.	Nipplewort	X					X
+	<i>Matricaria matricarioides</i> (Less.) Porter (<i>Chamomilla suaveolens</i> (Pursh) Rydb.)	Pineapple Weed	X					X
L	<i>Megalodonta beckii</i> (Torr. ex Spreng.) Greene (<i>Bidens beckii</i> Torr. ex Spreng.)	Water-marigold			X	X		R ²

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+	<i>Picris hieracioides</i> L. ssp. <i>hieracioides</i>	Hawkweed Oxtongue				X		X
	<i>Prenanthes alba</i> L.	Common White Lettuce	X	X	X		X	U
	<i>Prenanthes altissima</i> L.	Tall White-lettuce	X	X	X		X	X
	<i>Rudbeckia hirta</i> L. (<i>R. serotina</i> Nutt.)	Black-eyed Susan	X	X	X	X		X
	<i>Solidago altissima</i> L.	Tall Goldenrod	X	X	X	X	X	X
PRL	<i>Solidago arguta</i> Aiton var. <i>arguta</i>	Sharp-leaved Goldenrod	X	X				R ⁸
	<i>Solidago caesia</i> L.	Blue-stem Goldenrod	X	X	X		X	X
	<i>Solidago canadensis</i> L.	Canada Goldenrod	X	X	X	X	X	X
	<i>Solidago flexicaulis</i> L.	Zig-zag Goldenrod	X	X	X			X
L	<i>Solidago hispida</i> Muhlenb.	Hairy Goldenrod	X	X				R ⁹
	<i>Solidago nemoralis</i> Aiton	Gray Goldenrod	X	X		X		X
	<i>Solidago rugosa</i> Aiton ssp. <i>rugosa</i>	Rough Goldenrod	X	X	X	X		X
L	<i>Solidago squarrosa</i> Muhlenb. ex Nutt.	Stout Goldenrod	X	X				R ⁴
L	<i>Solidago uliginosa</i> Nutt.	Bog Goldenrod	X		X			R ¹⁴
+	<i>Sonchus arvensis</i> L. (incl. ssp. <i>arvensis</i> and ssp. <i>uliginosa</i> (M. Bieb.) Nyman)	Perennial Sow-thistle	X	X	X		X	X
+	<i>Taraxacum erythrospermum</i> Andrz. ex Besser	Red-seeded Dandelion	X			X		X
+	<i>Taraxacum officinale</i> G. Weber	Common Dandelion	X	X	X	X	X	X
+	<i>Tragopogon dubius</i> Scop.	Lemon Yellow Goat's-beard	X	X		X		X
+	<i>Tragopogon pratensis</i> L. ssp. <i>pratensis</i>	Meadow Goat's-beard	X	X				X
+	<i>Tussilago farfara</i> L.	Coltsfoot	X	X	X	X	X	X

ALISMATACEAE

WATER-PLANTAIN FAMILY

	<i>Alisma plantago-aquatica</i> L. (incl. <i>A. triviale</i> Pursh and <i>A. subcordatum</i> Raf.)	Common Water-plantain	X	X	X	X	X	
L	<i>Sagittaria cuneata</i> E. Sheld.	Wedgeleaf Arrowhead			H			R ⁷
	<i>Sagittaria latifolia</i> Willd.	Common Arrowhead	X	X	X	X	X	X

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		FROG'S-BIT FAMILY						
L	<i>Elodea canadensis</i> Rich. ex. Michx. (<i>Anacharis canadensis</i> (Rich. ex. Michx.) Planchon)	Canada Waterweed		X		X		R ¹²
L	<i>Vallisneria americana</i> Michx.	Tape-grass		X		X		R ⁶
		PONDWEED FAMILY						
L	<i>Potamogeton amplifolius</i> Tuckerm.	Large-leaved Pondweed	X	X		X		R ¹²
	<i>Potamogeton foliosus</i> Raf.	Leafy Pondweed	X	X	X	X	X	U
L	<i>Potamogeton gramineus</i> L.	Variable-leaved Pondweed		X		X		R ⁸
L	<i>Potamogeton illinoensis</i> Morong	Illinois Pondweed		X				R ³
	<i>Potamogeton natans</i> L.	Floating Pondweed		X		X		U
L	<i>Potamogeton nodosus</i> Poir.	Knotty Pondweed			X			R ²
	<i>Potamogeton pectinatus</i> L.	Sago Pondweed	X			X		U
L	<i>Potamogeton richardsonii</i> (A. Bennett) Rydb.	Richardson's Pondweed		X				R ²
L	<i>Potamogeton zosteriformis</i> Fern.	Flat-stemmed Pondweed		X		X		R ²⁰
		NAJADACEAE						
		NAIAD FAMILY						
	<i>Najas flexilis</i> (Willd.) Rost. & W. Schmidt	Slender Najas		X	X			U
		ARACEAE						
		ARUM FAMILY						
	<i>Arisaema triphyllum</i> (L.) Schott ssp. <i>triphyllum</i>	Jack-in-the-pulpit	X	X	X	X	X	X
	<i>Calla palustris</i> L.	Water Arum		X	X			U
PRL	<i>Peltandra virginica</i> (L.) Schott & Endl. ssp. <i>virginica</i>	Green Arrow Arum				X		R ¹
		LEMNACEAE						
		DUCKWEED FAMILY						
	<i>Lemna minor</i> L.	Common Duckweed	X	X	X	X	X	X
	<i>Lemna trisulca</i> L.	Star Duckweed		X		X	X	U
L	<i>Wolffia borealis</i> (Engelm.) Landolt (<i>W. punctata</i> Griseb.)	Northern Water-meal			X		X	R ¹⁴
L	<i>Wolffia columbiana</i> Karst. (<i>W. arrhiza</i> (L.) Horkel ex Wimmer)	Columbia Water-meal		X		X		R ¹⁵

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	JUNCACEAE	RUSH FAMILY						
L	<i>Juncus alpinearticulatus</i> Chaix. (<i>Juncus alpinus</i> Vill.)	Richardson's Rush				X		R ⁶
	<i>Juncus articulatus</i> L.	Jointed Rush	X		X	X		X
	<i>Juncus bufonius</i> L.	Toad Rush		X			X	U
	<i>Juncus dudleyi</i> Wiegelb.	Dudley's Rush	X		X	X	X	X
	<i>Juncus effusus</i> L. ssp. <i>solutus</i> (Fern. & Wiegand) Hämet-Ahti (<i>J. effusus</i> L. var. <i>solutus</i> Fern. & Wiegand)	Soft Rush				X		X
	<i>Juncus nodosus</i> L.	Knotted Rush	X			X	X	U
	<i>Juncus tenuis</i> Willd.	Path Rush	X	X		X		X
	CYPERACEAE	SEDGE FAMILY						
	<i>Carex albursina</i> E. Sheld. (<i>C. laxiflora</i> Lam. var. <i>latifolia</i> Boott)	White-bear Sedge	X	X				X
L	<i>Carex alopecoidea</i> Tuckerm.	Foxtail Sedge	X					R ⁷
	<i>Carex arctata</i> Boott	Compressed Sedge	X	X	X	X	X	X
RL	<i>Carex atherodes</i> Spreng.	Awned Sedge				X		R ⁸
	<i>Carex aurea</i> Nutt.	Golden Sedge				X		U
	<i>Carex bebbii</i> (L.H. Bailey) Olney ex Fern.	Bebb's Sedge		X	X	X	X	X
	<i>Carex blanda</i> Dewey (<i>C. laxiflora</i> Lam. var. <i>blanda</i> (Dewey) Boott)	Common Wood Sedge		X	X	X		X
L	<i>Carex brunnescens</i> (Pers.) Poir. ex Lam. ssp. <i>brunnescens</i>	Brownish Sedge		X				R ⁹
L	<i>Carex canescens</i> L. ssp. <i>canescens</i> (<i>C. curta</i> Good)	Silvery Sedge		X	X			R ²¹
L	<i>Carex cephalophora</i> Muhlenb. ex Willd.	Oval-headed Sedge	X	X			X	R ¹⁴
	<i>Carex communis</i> L.H. Bailey	Fibrous Rooted Sedge	X	X	X		X	X
	<i>Carex comosa</i> Boott	Bristly Sedge		X	X	X		U
	<i>Carex crinita</i> Lam.	Fringed Sedge		X	X			U
	<i>Carex cristatella</i> Britton	Crested Sedge	X	X		X		X
L	<i>Carex cryptolepis</i> Mack.	Small Yellow Sedge				X		R ²
	<i>Carex deweyana</i> Schwein.	Dewey's Sedge	X	X	X		X	X

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	<i>Carex diandra</i> Schrank	Lesser Paniced Sedge			X			U
	<i>Carex disperma</i> Dewey	Two-seeded Sedge	X	X				X
L	<i>Carex echinata</i> Murray ssp. <i>echinata</i> (<i>C. cephalantha</i> (L.H. Bailey) E.P. Bicknell; <i>C. muricata</i> L. var. <i>cephalantha</i> (L.H.Bailey) Wiegand & Eames)	Little Prickly Sedge		X	X			R ⁵
	<i>Carex flava</i> L.	Yellow Sedge				X		U
	<i>Carex gracillima</i> Schwein.	Graceful Sedge	X	X				X
	<i>Carex granularis</i> Muhlenb. ex Willd.	Meadow Sedge	X	X	X	X		X
	<i>Carex hystericina</i> Muhlenb. ex Willd.	Porcupine Sedge	X	X		X	X	X
	<i>Carex interior</i> L.H. Bailey	Inland Sedge	X	X	X	X		X
	<i>Carex intumescens</i> Rudge	Bladder Sedge	X	X	X			X
	<i>Carex lacustris</i> Willd.	Lake Sedge		X	X	X	X	X
	<i>Carex laeviginata</i> (Kükenth.) Mack.	Smooth-sheathed Sedge	X					U
L	<i>Carex lasiocarpa</i> Ehrh.	Slender Sedge			X		X	R ¹⁶
	<i>Carex laxiflora</i> Lam.	Loose-flowered Sedge	X	X			X	U
	<i>Carex leptalea</i> Wahlenb. ssp. <i>leptalea</i>	Bristle-stalked Sedge	X	X	X	X		X
	<i>Carex leptonervia</i> (Fern.) Fern.	Finely-nerved Sedge	X	X	X		X	X
L	<i>Carex limosa</i> L.	Mud Sedge				X		R ⁶
	<i>Carex lupulina</i> Muhlenb. ex Willd.	Hop Sedge		X		X		X
L	<i>Carex magellanica</i> Lam.. ssp. <i>irrigua</i> (Wahlenb.) Hiit (<i>C. paupercula</i> .Michx)	Stunted Sedge		X	X			R ¹⁵
L	<i>Carex molesta</i> Mack. (<i>C. brevior</i> (Dewey) Mack. ex Lunnell var. <i>molesta</i> (Mack.) Gates)	Troublesome Sedge			X			R ⁶
	<i>Carex peckii</i> Howe	Peck's Sedge	X	X	X		X	X
	<i>Carex pedunculata</i> Muhlenb. ex Willd.	Peduncled Sedge	X	X	X		X	X
L	<i>Carex pellita</i> Willd. (<i>C. lanuginosa</i> Michx.)	Woolly Sedge				X		R ⁵
	<i>Carex pensylvanica</i> Lam.	Pennsylvania Sedge	X	X	X		X	X
	<i>Carex plantaginea</i> Lam.	Plantain-leaved Sedge		X				X

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	<i>Carex projecta</i> Mack.	Necklace Sedge	X	X		X		X
	<i>Carex pseudo-cyperus</i> L.	Cyperus-like Sedge		X	X	X	X	X
	<i>Carex radiata</i> (Wahlenb.) Small	Straight-styled Wood Sedge			X	X		X
	<i>Carex retrorsa</i> Schwein.	Retorse Sedge	X	X		X		X
	<i>Carex rosea</i> Schkuhr ex Willd (<i>C. convoluta</i> Mack.)	Curly-styled Wood Sedge	X	X	X	X	X	X
	<i>Carex scabrata</i> Schwein.	Rough Sedge	X					U
	<i>Carex sparaganioides</i> Muhlenb. ex Willd.	Burreed Sedge	X	X	X		X	X
+	<i>Carex spicata</i> Hudson	Spiked Sedge		X				X
	<i>Carex stipata</i> Muhlenb. ex Willd.	Awl-fruited Sedge	X	X	X	X	X	X
	<i>Carex stricta</i> Lam.	Tussock Sedge			X	X	X	X
	<i>Carex tenera</i> Dewey	Slender-headed Sedge	X			X		X
RL	<i>Carex tenuiflora</i> Wahlenb.	Sparse-flowered Sedge				X		R ¹
L	<i>Carex tonsa</i> (Fern.) Bicknell var. <i>rugosperma</i> (Mack.) Crins (<i>Carex rugosperma</i> Mack.)	Red-seeded Sedge	X	X				R ¹³
L	<i>Carex tribuloides</i> Wahlenb.	Blunt Broom Sedge		X				R ¹⁰
	<i>Carex trisperma</i> Dewey var. <i>billingsii</i> Knight	Three-fruited Sedge		X	X			U
	<i>Carex tuckermanii</i> Dewey	Tuckerman's Sedge			X			U
L	<i>Carex utriculata</i> Boott (<i>C. rostrata</i> Stokes var. <i>utriculata</i> (Boott) L.H. Bailey)	Beaked Sedge				X		R ²⁰
	<i>Carex vulpinoidea</i> Michx.	Fox Sedge	X		X	X	X	X
L	<i>Cyperus bipartitus</i> Torr. (<i>C. rivularis</i> Kunth)	River Cyperus				X		R ²
L	<i>Cyperus lupulinus</i> (Spreng.) Marcks (incl. ssp. <i>lupulinus</i> and ssp. <i>macilentus</i> (Fern.) Marcks) (<i>C. filiculmis</i>)	Slender Cyperus	X	X				R ¹¹
L	<i>Dulichium arundinaceum</i> (L.) Britton	Three-way Sedge		X	X		X	R ¹⁹
L	<i>Eleocharis acicularis</i> (L.) Roem. & Schult.	Needle Spike-rush			X		X	R ¹²
	<i>Eleocharis erythropoda</i> Steud. (<i>E. calva</i> Torr.)	Red-stemmed Spike-rush	X		X	X	X	X
	<i>Eleocharis obtusa</i> (Willd.) Schult.	Blunt Spike-rush			X			U

<u>Status</u>	<u>Species</u>	<u>Common Name</u>	<u>J</u>	<u>W</u>	<u>B</u>	<u>S</u>	<u>P</u>	<u>6E7</u>
	<i>Eleocharis smallii</i> Britton (<i>E. palustris</i> (L.) Roem. & Schult.)	Small's Spike-rush				X		U
RL	<i>Eriophorum tenellum</i> Nutt.	Rough Cotton Grass			X			R ²
L	<i>Eriophorum vaginatum</i> L. ssp. <i>spissum</i> (Fern.) Hultén (<i>E. spissum</i> Fern.)	Dense Cotton-grass		X	X			R ⁵
L	<i>Eriophorum virginicum</i> L.	Tawny Cotton-grass		X	X			R ¹¹
L	<i>Scirpus acutus</i> Muhlenb. ex Bigelow	Hard-stemmed Bulrush				X		R ⁷
	<i>Scirpus atrovirens</i> Willd.	Black Bulrush	X		X	X	X	X
	<i>Scirpus cyperinus</i> (L.) Kunth	Wool-grass		X	X	X		X
	<i>Scirpus microcarpus</i> C. Presl (<i>S. rubrotinctus</i> Fern.)	Red-sheathed Bulrush	X					U
	<i>Scirpus validus</i> L.	Softstem Bulrush		X	X	X	X	X
POACEAE		GRASS FAMILY						
+	<i>Agrostis gigantea</i> Roth (<i>A. alba</i> L.)	Red-top	X	X	X	X	X	X
L	<i>Agrostis perennans</i> (Walter) Tuckerm.	Autumn Bent Grass		X	X			R ⁹
	<i>Agrostis scabra</i> Willd. (<i>A. hiemalis</i> (Walter) B.S.P. var. <i>tenuis</i> (Tuckerm.) Gleason)	Rough Hair Grass		X	X			U
+	<i>Agrostis stolonifera</i> L. (<i>A. alba</i> L. var. <i>palustris</i> (Hudson) Pers.)	Creeping Bent Grass	X	X	X	X		X
L	<i>Alopecurus aequalis</i> Sobol.	Short-awned Foxtail				X		R ¹⁵
L	<i>Andropogon gerardii</i> Vitman	Big Bluestem	X					R ³³
	<i>Bromus ciliatus</i> L. (incl. <i>B. dudleyi</i> Fern.)	Fringed Brome	X					U
+	<i>Bromus inermis</i> Leyss. ssp. <i>inermis</i>	Awnless Brome	X	X	X	X	X	X
	<i>Calamagrostis canadensis</i> (Michx.) P. Beauv.	Canada Blue-joint		X	X	X	X	X
	<i>Cinna latifolia</i> (Trevir. ex Goepp.)	Nodding Wood Grass	X	X	X			X
+	<i>Dactylis glomerata</i> L.	Orchard Grass	X	X	X	X	X	X
	<i>Danthonia spicata</i> (L.) P. Beauv. ex. Roem. & Schult.	Poverty Oat Grass	X	X	X	X		X

<u>Status</u>	<u>Species</u>	<u>Common Name</u>	<u>J</u>	<u>W</u>	<u>B</u>	<u>S</u>	<u>P</u>	<u>6E7</u>
+	<i>Digitaria ischaemum</i> (Schreb. ex Schwein.) Schreb. ex Muhlenb.	Smooth Crabgrass	X	X				X
+	<i>Echinochloa crusgalli</i> (L.) P. Beauv. <i>Elymus hystrix</i> L. (<i>Hystrix patula</i> Moench)	Common Barnyard Grass Bottle-brush Grass	X	X	X			X U
+	<i>Elymus repens</i> (L.) Gould (<i>Agropyron repens</i> (L.) P. Beauv.)	Quack Grass	X	X	X	X		X
L	<i>Elymus riparius</i> Weigand	River-bank Wild Rye				X		R ⁷
L	<i>Elymus trachycaulus</i> (Link) Gould in Shinn ssp. <i>trachycaulus</i> (<i>Agropyron trachycaulum</i> (Link) Malte ex H. Lewis)	Slender Wheat Grass	X	X				R ¹²
+	<i>Festuca arundinacea</i> Schreb. (<i>F. elatior</i> L. ssp. <i>arundinacea</i> (Schreb.) Celak)	Field Fescue		X		X	X	X
+	<i>Festuca pratensis</i> Hudson (<i>F. elatior</i> L. var. <i>pratensis</i> A. Gray)	Meadow Fescue	X			X		X
(+)	<i>Festuca rubra</i> L. ssp. <i>rubra</i>	Red Fescue	X					X
	<i>Festuca subverticillata</i> (Pers.) Alexeev (<i>F. obtusa</i> Biehler)	Nodding Fescue		X				U
+	<i>Festuca trachyphylla</i> (Hack.) Krajina (<i>F. brevipila</i> (Tracy); <i>F. longifolia</i> Thuill.; <i>F. ovina</i> L. var. <i>duriuscula</i> (L.) Koch	Sheep Fescue		X		X		X
	<i>Glyceria borealis</i> (Nash) Batch.	Northern Manna Grass		X	X	X		U
L	<i>Glyceria canadensis</i> (Michx.) Trin.	Rattlesnake Manna Grass		X			X	R ¹¹
	<i>Glyceria grandis</i> S. Wilson	Tall Manna Grass	X	X	X			X
L	<i>Glyceria septentrionalis</i> A. Hitchc.	Floating Manna Grass		X				R ¹⁴
	<i>Glyceria striata</i> (Lam.) Hitchc.	Fowl Manna Grass	X	X	X	X	X	X
	<i>Leersia oryzoides</i> (L.) Sw.	Rice Cut Grass	X	X	X	X	X	X
L	<i>Leersia virginica</i> Willd.	White Cut Grass		X				R ⁴
+	<i>Lolium perenne</i> L. (<i>Lolium multiflorum</i> Lam.)	Perennial Rye Grass	X					X
+	<i>Miscanthus sacchariflorus</i> (Maxim.) Hack	Amur Silver Grass					X	X
	<i>Muhlenbergia mexicana</i> L. Trin. (incl. var. <i>filiformis</i> (Willd.) Scribn and var. <i>mexicana</i>)	Mexican Muhly Grass	X			X		X

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	<i>Oryzopsis asperifolia</i> Michx.	White-grained Mountain-rice	X	X	X		X	X
L	<i>Oryzopsis pungens</i> (Torr. ex Spreng.) A. Hitch.	Slender Mountain-rice	H	-	-			H
	<i>Panicum acuminatum</i> Sw. var. <i>acuminatum</i> (<i>Panicum lanuginosum</i> Ell.; <i>Dichanthelium acuminatum</i> (Sw.) Gould & C.A. Clark var. <i>acuminatum</i>)	Acuminate Panic Grass	X	X		X		X
	<i>Panicum capillare</i> L.	Witch Grass	X				X	X
L	<i>Panicum columbianum</i> Scribn.	Columbian Panic Grass	X					R ⁴
L	<i>Panicum latifolium</i> L. (<i>Dichanthelium latifolium</i> (L.) Gould & C. A. Clark)	Broad-leaved Panic Grass	X	X				R ⁶
L	<i>Panicum linearifolium</i> Nash (<i>Dichanthelium linearifolium</i> (Scribn.) Gould)	Narrow-leaved Panic Grass	X	X				R ¹⁶
L	<i>Panicum xanthophysum</i> A. Gray (<i>Dichanthelium xanthophysum</i> (A. Gray) Freckmann)	Yellow Panic Grass	X					R ⁴
	<i>Phalaris arundinacea</i> L.	Reed Canary Grass	X	X	X	X	X	X
+	<i>Phleum pratense</i> L.	Timothy	X	X	X	X		X
	<i>Poa alsodes</i> A. Gray	Woodland Poa		X				U
+	<i>Poa annua</i> L.	Annual Blue Grass				X		X
(+)	<i>Poa compressa</i> L.	Canada Blue Grass	X	X	X	X	X	X
L	<i>Poa languida</i> Hitchc.	Languid Poa	X					R ¹
+	<i>Poa nemoralis</i> L.	Wood Blue Grass	X	X	X			X
	<i>Poa palustris</i> L.	Fowl Meadow Grass	X	X	X	X		X
+	<i>Poa pratensis</i> L. ssp. <i>pratensis</i>	Kentucky Blue Grass	X	X	X	X	X	X
+	<i>Poa trivialis</i> L.	Rough Blue Grass	X					X
	<i>Schizachne purpurascens</i> (Torr.) Swallen ssp. <i>purpurascens</i>	False Melic Grass	X	X				X
+	<i>S. glauca</i> auct. P. Beauv (<i>Setaria pumila</i> (Poir.) Schult.)	Yellow Foxtail	X					X
+	<i>Setaria viridis</i> (L.) P. Beauv.	Green Foxtail	X	X	X	X	X	X
	<i>Sphenopholis intermedia</i> (Rydb.) Rydb.	Slender Wedge Grass		X	X			U
	<i>Sporobolus cryptandrus</i> (Torr.) A. Gray	Sand Dropseed	X	X				U

<u>Status</u>	<u>Species</u>	<u>Common Name</u>	<u>J</u>	<u>W</u>	<u>B</u>	<u>S</u>	<u>P</u>	<u>6E7</u>
	SPARGANIACEAE	BUR-REED FAMILY						
	<i>Sparganium emersum</i> Rehmann ssp <i>emersum</i> (<i>S.chlorocarpum</i> Rydb.)	-Green-fruited Bur-reed	X		X	X		X
L	<i>Sparganium eurycarpum</i> Engelm. ex. A.Gray	Giant Bur-reed			X	X		R ¹⁵
	TYPHACEAE	CAT-TAIL FAMILY						
	<i>Typha angustifolia</i> L.	Narrow-leaved Cattail	X		X	X	X	X
	<i>Typha latifolia</i> L.	Common Cattail	X	X	X	X	X	X
	LILIACEAE	LILY FAMILY						
	<i>Allium tricoccum</i> Aiton	Wild Leek			X			X
+	<i>Asparagus officinalis</i> L.	Garden Asparagus	X	X	X	X		X
	<i>Clintonia borealis</i> (Aiton) Raf.	Bluebead-lily	X	X	X		X	X
+	<i>Convallaria majalis</i> L.	Lily-of-the-valley	X	X	X	X		X
	<i>Erythronium americanum</i> Ker. Gawler ssp. <i>americanum</i>	Yellow Trout-lily	X	X	X	X	X	X
+	<i>Hemerocallis fulva</i> (L.) L.	Orange Day-lily	X	X	X	X	X	X
	<i>Maianthemum canadense</i> Desf.	Wild Lily-of-the-valley	X	X	X	X	X	X
	<i>Maianthemum racemosum</i> (L.) Link ssp. <i>racemosum</i> (<i>Smilacina racemosum</i> (L.) Desf.)X	False Solomon's-seal	X	X	X	X	X	X
	<i>Maianthemum trifolium</i> (L.) Sloboda (<i>Smilacina trifolium</i> (L.) Desf.)	Three-leaved Solomon's-seal	X	X	X			U
	<i>Medeola virginiana</i> L.	Indian Cucumber-root	X	X				U
	<i>Polygonatum pubescens</i> (Willd.) Pursh	Hairy Solomon's-seal	X	X	X		X	X
	<i>Streptopus roseus</i> Michx.	Rose Twisted Stalk	X	X	X			X
	<i>Trillium erectum</i> L.	Red Trillium	X	X	X	X		X
	<i>Trillium grandiflorum</i> (Michx.) Salisb.	White Trillium	X	X	X	X	X	X
	<i>Uvularia grandiflora</i> Sm.	Large-flowered Bellwort	X	X	X			X
	IRIDACEAE	IRIS FAMILY						
	<i>Iris versicolor</i> L.	Larger Blue-flag		X	X	X	X	X
	<i>Sisyrinchium montanum</i> Greene	Little Blue-eyed Grass		X		X		U

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	SMILACEAE	SMILAX FAMILY						
	<i>Smilax herbacea</i> L.	Herbaceous Carrion-flower	-X	X	X	X	X	X
	<i>Smilax hispida</i> Muhlenb. ex Torr. (<i>S. tamnoides</i> L. var. <i>hispida</i> (Muhlenb. ex Torr.) Fern.)	Bristly Greenbrier	X	X	X		X	U
	ORCHIDACEAE	ORCHID FAMILY						
L	<i>Corallorrhiza maculata</i> (Raf.) Raf.	Spotted Coral-root	H	X				R ¹⁴
L	<i>Corallorrhiza trifida</i> Chat.	Early Coral-root				H		R ¹⁵
L	<i>Cypripedium acaule</i> Aiton	Moccasin Flower		H				R ³
L	<i>Cypripedium calceolus</i> L.	Yellow Lady's Slipper				X	X	R ¹⁸
L	<i>Cypripedium reginae</i> Walter	Showy Lady's Slipper	X					R ¹⁷
+	<i>Epipactis helleborine</i> (L.) Crantz	Helleborine	X	X	X	X	X	X
L	<i>Galearis spectabilis</i> (L.) Raf. (<i>Orchis spectabilis</i> L.) var. <i>ophioides</i> Fern.	Showy Orchis		X				R ¹²
L	<i>Liparis loeselii</i> (L.) Rich. ex Lindl.	Loesel's Twayblade	X			X	X	R ²⁰
L	<i>Malaxis monophyllos</i> (L.) Sw. ssp. <i>brachypoda</i> (A. Gray) A. & D. Löve (<i>M. brachypoda</i> (A. Gray) Fern.)	White Adder's-mouth	X					R ¹³
PRL	<i>Platanthera blephariglottis</i> (Willd.) Lindl. var. <i>blephariglottis</i> (<i>Habenaria blephariglottis</i> (Willd.) Hook.)	White Fringed Orchid		H			H	
	<i>Platanthera hyperborea</i> (L.) Lindl. (<i>Habenaria hyperborea</i> (L.) R.Br.)	Northern Green Orchid	X					U
L	<i>Pogonia ophioglossoides</i> (L.) Juss.	Rose Pogonia		H				R ⁴
L	<i>Spiranthes cernua</i> (L.) Rich.	Nodding Ladies' Tresses	X			X		R ¹³
L	<i>Spiranthes romanzoffiana</i> Cham.	Hooded Ladies' Tresses				X		R ¹

TOTALS:

440 436 353 308 260 639

APPENDIX B:
BREEDING BIRDS IN
FIVE AREAS OF NATURAL AND SCIENTIFIC INTEREST
ON THE OAK RIDGES MORAINE, TOWN OF RICHMOND HILL, ONTARIO

A total of 81 breeding bird species have been recorded in the five ANSIs on the Richmond Hill portion of the Oak Ridges Moraine. Within each ANSI, 40 species are found in Jefferson Forest (J), 53 in Wilcox Lake Kettle Wetlands & Uplands (W), 48 in Bond Lake & Bog (B), 53 in Lake St. George (S) and 37 in Philips Lake (P).

Significant species are noted in the four status columns. One species, Red-shouldered Hawk, is provincially vulnerable (Pv). A total of 42 species are considered conservation priority species, based on Bird Studies Canada (Couturier, 1999). Conservation priority species are rated from level 1 (highest) to level 4 (lowest). Twenty-six are considered species of concern in the Toronto and Region Conservation Authority watershed (TRCA, 2001). Twenty-two bird species are considered sensitive forest species, based on Cadman (1999), Couturier (1999) and Burke & Nol (2000). Sensitive forest species have the highest sensitivity to forest cover in southern Ontario (Cadman, 1999). Nine species are considered locally rare or uncommon in the TRCA watershed (pers. comm. Lionel Normand, 1999). These species are known to occur at twenty stations or less within the TRCA watershed.

Breeding status for each ANSI is noted as confirmed breeding (C), probably breeding (P), possible breeding (o) or observed during the breeding season (x).

The records are based on fieldwork undertaken by Lionel Normand (TRCA, 1996, 1997, 2000), Gore and Storrie's fieldwork in 1992 (Gore and Storrie, 1993), James Kamstra's fieldwork for Jefferson Forest (Gartner Lee Ltd., 1997, 2000), Dan Gregory's fieldwork for Philips Lake (Michalski Assoc., 1999), David Green's fieldwork for Lake St. George (2000), Fennerty and Collshaw's fieldwork for Lake St. George (1978) and incidental observations by MNR and TRCA staff (1996-2000).

Species	ANSIs					Conservation Priority Species	Sensitive of Forest Concern	Locally Rare or Uncommon Species
	J	W	B	S	P			
Green Heron <i>Butorides striatus</i>					o	L4	*	
Canada Goose <i>Branta canadensis</i>			C			C		
Wood Duck <i>Aix sponsa</i>			C	o		P	L4	

Species	ANSIs					Priority Species	Conservation of Forest Concern	Sensitive Species	Locally
	J	W	B	S	P			Forest	Rare or Uncommon
Mallard <i>Anas platyrhynchos</i>		P	P	P	C				
Blue-winged Teal <i>Anas discors</i>				O		L3			
Pied-billed Grebe <i>Podilymbus podiceps</i>				O		L2	*		*
Northern Goshawk <i>Accipiter gentilis</i>			C			L2	*	*	*
Pv Red-shouldered Hawk <i>Buteo lineatus</i>	x					L2	*	*	
Broad-winged Hawk <i>Buteo platypterus</i>		x				L2	*	*	*
Red-tailed Hawk <i>Buteo jamaicensis</i>	P	O	P	O	O				
Sharp-shinned Hawk <i>Accipiter striatus</i>				O		L2	*	*	*
Ring-necked Pheasant <i>Phasianus colchicus</i>				X					
Ruffed Grouse <i>Bonasa umbellus</i>	P	O	O	X		L3	*	*	
Wild Turkey <i>Meleagris gallopavo</i>			X						
Virginia Rail <i>Rallus limicola</i>		O		P		L1	*		
Killdeer <i>Charadrius vociferus</i>		O	O	O	O				
Spotted Sandpiper <i>Actitis macularia</i>		P		O		L4			
American Woodcock <i>Philohela minor</i>	P					L4	*		
Rock Dove <i>Columba livia</i>		O							

Species	ANSIs					Priority Species	Conservation Species of Concern	Sensitive Forest Species	Locally Rare or Uncommon
	J	W	B	S	P				
Mourning Dove <i>Zenaida macroura</i>	P	o	o	o	o				
Black-billed Cuckoo <i>Coccyzus erythrophthalmus</i>		o			o	L2		*	
Yellow-billed Cuckoo <i>Coccyzus americanus</i>				o		L3		*	
Eastern Screech-Owl <i>Otus asio</i>				o					
Great Horned Owl <i>Bubo virginianus</i>					P				
Barred Owl <i>Strix varia</i>			o			L1		*	*
Belted Kingfisher <i>Megaceryle alcyon</i>			x		x				
Downy Woodpecker <i>Picoides pubescens</i>		o	P	P	x	P			
Hairy Woodpecker <i>Picoides villosus</i>		C	P	o	o	o			
Northern Flicker <i>Colaptes auratus</i>		P	o	P	o	o			
Pileated Woodpecker <i>Dryocopus pileatus</i>		o	o			L2		*	
Eastern Wood-Pewee <i>Contopus virens</i>		P	P	o		P		*	
Alder Flycatcher <i>Empidonax alnorum</i>				o		L3		*	
Willow Flycatcher <i>Empidonax traillii</i>			o		o				
Eastern Phoebe <i>Sayornis phoebe</i>				o		L3		*	
Great-crested Flycatcher <i>Myiarchus crinitus</i>		P	P	o	o	P			
Eastern Kingbird <i>Tryannus tyrannus</i>		P	P	o	o	P	L3		

Species	ANSIs					Priority Species	Sensitive of Forest Species	Locally Rare or Uncommon
	J	W	B	S	P			
Tree Swallow <i>Iridoprocne bicolor</i>				P	o	o		
Barn Swallow <i>Hirundo rustica</i>					o		L4	
Blue Jay <i>Cyanocitta cristata</i>			P	P	o	P		
American Crow <i>Corvus brachyrhynchos</i>		P	P	o	o	o		
Black-capped Chickadee <i>Parus atricapillus</i>	P	C	P	o	P		L4	
Red-breasted Nuthatch <i>Sitta canadensis</i>	P	o	o				L3	*
White-breasted Nuthatch <i>Sitta carolinensis</i>		o	o	o				
Brown Creeper <i>Certhia familiaris</i>	P	o		x		L2	*	*
House Wren <i>Troglodytes aedon</i>		P	o	o	P			
Veery <i>Catharus fuscescens</i>			o	o		L3	*	*
Wood Thrush <i>Hylocichla mustelina</i>	P	P	o	o		L4	*	*
American Robin <i>Turdus migratorius</i>	C	P	P	o	P			
Gray Catbird <i>Dumetella carolinensis</i>		o	P	o	o	x	L4	
Cedar Waxwing <i>Bombycilla cedrorum</i>	C	P	o	o	o			
European Starling <i>Sturnus vulgaris</i>				o	x			
Warbling Vireo <i>Vireo gilvus</i>		o	o			o		

Species	ANSIs					Priority	Species of Concern	Sensitive Forest Species	Locally Rare or Uncommon
	J	W	B	S	P				
Red-eyed Vireo <i>Vireo olivaceus</i>	P	P	o	o	o				
Nashville Warbler <i>Vermivora ruficapilla</i>					o	L1	*	*	*
Yellow Warbler <i>Dendroica petechia</i>			P	o	P				
Pine Warbler <i>Dendroica pinus</i>	P					L2	*	*	
Black-and-white Warbler <i>Mniotilla varia</i>				o		L3	*	*	
American Redstart <i>Setophaga ruticilla</i>		o		o		L2	*	*	
Ovenbird <i>Seiurus aurocapillus</i>	P	o				L4	*	*	
Northern Waterthrush <i>Seiurus noveboracensis</i>			o	o		L2	*	*	
Mourning Warbler <i>Oporornis philadelphus</i>	o		o			L2		*	
Common Yellowthroat <i>Geothlypis trichas</i>		P	P	o	P				
Scarlet Tanager <i>Piranga oliacea</i>	P	P	o	x		L2	*	*	
Northern Cardinal <i>Cardinalis cardinalis</i>	P	P	P	o	P				
Rose-breasted Grosbeak <i>Pheucticus ludovicianus</i>		P	o	o					
Indigo Bunting <i>Passerina cyanea</i>	P	P	o	x					
Chipping Sparrow <i>Spizella passerina</i>	P		o	o	x				
Field Sparrow <i>Spizella pusilla</i>	P	P				L3			

Species	ANSIs					Priority of Concern Species	Sensitive Forest Species	Locally Rare or Uncommon
	J	W	B	S	P			
Vesper Sparrow <i>Pooecetes gramineus</i>			o	o		L3		
Savannah Sparrow <i>Passerculus sandwichensis</i>	P	P		o		L1		
Song Sparrow <i>Melospiza melodia</i>	P	P	P	o	P			
Swamp Sparrow <i>Melospiza georgiana</i>	o	P	o			L2		
White-throated Sparrow <i>Zonotrichia albicollus</i>	o		o			L2	*	*
Bobolink <i>Dolichonyx oryzivorus</i>	P		o	x		L2	*	
Red-winged Blackbird <i>Agelaius phoeniceus</i>	P	P	o	P				
Eastern Meadowlark <i>Sturnella magna</i>			o			L3	*	
Common Grackle <i>Quiscalus quiscula</i>	o	o	o	P				
Brown-headed Cowbird <i>Molothrus ater</i>	C	P	o	o	o			
Northern Oriole <i>Icterus galbula</i>	o	o	P	o	o			
House Finch <i>Carpodacus mexicanus</i>	o				x			
American Goldfinch <i>Carduelis tristis</i>	P	P	P	o	x	L3		
TOTALS:	40	53	48	53	37			

APPENDIX C:
REPTILES & AMPHIBIANS IN
FIVE AREAS OF NATURAL AND SCIENTIFIC INTEREST
ON THE OAK RIDGES MORaine, TOWN OF RICHMOND HILL, ONTARIO

A total of 18 reptiles and amphibians have been recorded in the five ANSIs on the Richmond Hill portion of the Oak Ridges Moraine. Within each ANSI, 12 species are found in Jefferson Forest (J), 12 in Wilcox Lake Kettle Wetlands & Uplands (W), 9 in Bond Lake & Bog, 12 in Lake St. George and 8 in Philips Lake (P). Ten species are considered species of concern in the Toronto and Region Conservation Authority watershed (TRCA, 2001). Four species are rare (L) in the TRCA watershed, as they are known from 20 or less stations (pers. comm. Lionel Normand, 2001). One species, the Jefferson Salamander, is nationally threatened (Nt).

The records are based on fieldwork undertaken by Lionel Normand (TRCA 1996, 1997), Gore & Storrie's fieldwork in 1992 (Gore & Storrie, 1993), observations by MNR staff (1996-2001), observations by Natalie Helferty (Helferty, 2000, 2001), observations by David Green for Lake St. George (2000), and observations by David Cunningham and Dan Gregory for Philips Lake (Michalski Assoc., 1999, 2000).

Status	Species	J	W	B	S	P	Species Of Concern
L	Blue-spotted Salamander <i>Ambystoma laterale</i>	+	+				*
NtL	Jefferson Salamander <i>Ambystoma jeffersonianum</i>	+	+				*
	Spotted Salamander <i>Ambystoma maculatum</i>	+	+				*
	Red-spotted Newt <i>Notophthalmus viridescens</i> <i>viridescens</i>			+			*
	Northern Redback Salamander <i>Plethodon cinereus</i>					+	
	American Toad <i>Bufo americanus</i>	+	+	+	+	+	
	Northern Spring Peeper <i>Hyla crucifer crucifer</i>	+	+	+	+	+	*
	Tetraploid Gray Treefrog <i>Hyla versicolor</i>	+	+	+			
	Western Chorus Frog <i>Pseudacris triseriata triseriata</i>			+		+	*
	Wood Frog <i>Rana sylvatica</i>	+	+	+	+	+	*
	Northern Leopard Frog <i>Rana pipiens</i>	+	+	+	+	+	
	Green Frog <i>Rana clamitans melanota</i>	+	+	+	+	+	
L	Bullfrog <i>Rana catesbeiana</i>					+	*

Status	Species	J	W	B	S	P	Species Of Concern
	Common Snapping Turtle <i>Chelydra serpentina</i>				+	+	+
	Midland Painted Turtle <i>Chrysemys picta marginata</i>		+	+	+	+	
	Eastern Garter Snake <i>Thamnophis sirtalis sirtalis</i>	+	+	+	+		
	Brown Snake <i>Storeria dekayi</i>					+	
L	Northern Redbelly Snake <i>Storeria occipitomaculata</i>	+			+		*
TOTALS:		12	12	9	12	8	

APPENDIX D:
MAMMALS IN
FIVE AREAS OF NATURAL AND SCIENTIFIC INTEREST
ON THE OAK RIDGES MORaine, TOWN OF RICHMOND HILL, ONTARIO

A total of 22 mammals have been recorded in the five ANSIs on the Richmond Hill portion of the Oak Ridges Moraine. Within each ANSI, 12 mammals are known from Jefferson Forest (J), 13 in Wilcox Lake Kettle Wetlands & Uplands (W), 10 in Bond Lake & Bog, 21 in Lake St. George and 9 in Philips Lake. With the exception of the Lake St. George ANSI, the records are incomplete. One species, Ermine, is considered a species of concern in the Toronto and Region Conservation Authority watershed (TRCA, 2001).

The records are based on David Green's fieldwork in Lake St. George (2000), Dan Gregory and David Cunningham's fieldwork for Philips Lake (Michalski Assoc., 1999), Lionel Normand's fieldwork (TRCA, 1996, 1997) and observations by MNR staff (1996-2001).

Species		J	W	B	S	P	Species Of Concern
Short-tailed Shrew	<i>Blarina brevicauda</i>					+	
Masked Shrew	<i>Sorex palustris</i>					+	
Star-nosed Mole	<i>Condylura cristata</i>					+	
Little Brown Bat	<i>Myotis lucifugus</i>					+	
Big Brown Bat	<i>Eptesicus fuscus</i>					+	
European Hare	<i>Lepus europaeus</i>				+		
Eastern Cottontail	<i>Sylvilagus floridanus</i>	+	+	+	+	+	
Eastern Chipmunk	<i>Tamias striatus</i>	+	+	+	+	+	
Woodchuck	<i>Marmota monax</i>	+	+	+	+	+	
Gray Squirrel	<i>Sciurus carolinensis</i>	+	+	+	+	+	
Red Squirrel	<i>Tamiasciurus hudsonicus</i>	+	+	+	+	+	
Beaver	<i>Castor canadensis</i>	+				+	
Deer Mouse/ White-footed Mouse	<i>Peromyscus</i> sp.			+		+	
Meadow Vole	<i>Microtus pennsylvanicus</i>				+	+	

Species		J	W	B	S	P	Species Of Concern
Muskrat	<i>Ondatra zibethicus</i>	+	+		+		
Coyote	<i>Canis latrans</i>	+	+	+	+	+	
Red Fox	<i>Vulpes vulpes</i>	+	+	+	+		
Raccoon	<i>Procyon lotor</i>	+	+	+	+	+	
Ermine	<i>Mustela erminea</i>				+		*
Mink	<i>Mustela vison</i>				+		
Striped Skunk	<i>Mephitis mephitis</i>	+	+	+	+		
White-tailed Deer	<i>Odocoileus hemionus</i>	+	+	+	+	+	
TOTALS:		12	13	10	21	9	

APPENDIX E:
FISH IN
FIVE AREAS OF NATURAL AND SCIENTIFIC INTEREST
ON THE OAK RIDGES MORAINE, TOWN OF RICHMOND HILL, ONTARIO

A total of 25 fish species have been recorded in the five ANSIs on the Richmond Hill portion of the Oak Ridges Moraine. Within each ANSI, 11 species are found in the streams of Jefferson Forest (J), 3 in Swan Lake in Wilcox Lake Kettle Wetlands & Uplands (W), 8 in Bond Lake & Bog (B), including 2 historical records (H), 15 in Lake St. George (S) and 6 in Philips Lake (P). One fish, the Redside Dace, is provincially threatened (T). The records are based on the Ministry of Natural Resources' Aurora District fisheries data files.

Status	Species	J	W	B	S	P
	Walleye <i>Stizostedion vitreum</i>				+	
	Bluegill <i>Lepomis macrochirus</i>				+	
	Rock Bass <i>Ambloplites rupestris</i>				+	
	Northern Pike <i>Esox lucius</i>			+	+	
	Brown Bullhead <i>Ameiurus nebulosus</i>	+	+	+	+	+
	Pumpkinseed <i>Lepomis gibbosus</i>			+	+	+
	Brook Trout <i>Salvelinus fontinalis</i>	+		H		
	White Sucker <i>Catostomus catostomus</i>	+		H	+	
	Largemouth Bass <i>Micropterus salmoides</i>		+		+	+
	Smallmouth Bass <i>Micropterus dolomieu</i>					+
	Banded Killifish <i>Fundulus diaphanus</i>	+	+	+		
	Iowa Darter <i>Etheostoma exile</i>			+	+	
	Creek Chub <i>Semotilus atromaculatus</i>	+				
	Common Shiner <i>Notropis cornutus</i>	+			+	
	Blacknose Dace <i>Rhinichthys atratulus</i>	+				
	Northern Redbelly Dace <i>Phoxinus eos</i>	+				
	Longnose Dace <i>Rhinichthys cataractae</i>	+				
T	Redside Dace <i>Clinostomus elongatus</i>			+		
	Johnny Darter <i>Etheostoma nigrum</i>			+		

Status	Species	J	W	B	S	P
Fathead Minnow	<i>Pimephales promelas</i>	+				
Yellow Perch	<i>Perca flavescens</i>		+	+		
Golden Shiner	<i>Notemigonus crysoleucas</i>	+	+	+		
Central Mudminnow	<i>Campostoma anomalum</i>				+	
Bluntnose Minnow	<i>Pimephales notatus</i>				+	
American Brook Lamprey	<i>Lampetra lamottei</i>	+				

TOTALS:

11 3 8 15 6

3 1761 11548349 7

